A NEURO-PSYCHOLOGICAL STUDY OF SPIRITUAL CHARACTERISTICS OF TYAGOPANISHAD

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ABSTRACT

There are no scientific studies attempted on saint Tyagaya's musical compositions and its association to the brain mechanism. The research is designed to test the hypothesis that the meditative *Sangeetham* of Tyagopanishad could produce an unique emotional response in the brain and thus connect to a higher "God Consciousness". Thus, interpreting that *sangeetham* as a spiritual practice manifests a 'God Form" experience and therefore provides an access to the highest spiritual reality. Special emphasis is placed on how Swami Tyagaya's devotion creates the vision of God. The study uses both qualitative and quantitative research methods to analyze and infer the primary and secondary data from reliable literatures, survey and EEG experiments. The qualitative research method endorses the Interpretative Phenomenological Analysis (IPA) methodology for the comprehension of the various literatures. Phenomenological methods are particularly effective at bringing to the fore the experiences of individuals from their own perspectives. The quantitative research method deals with the data of the questionnaire survey and Electroencephalogram (EEG) experiment. The questionnaire survey offers a subjective procedure to rationalize the society's view on Saint Tyagaya, *sangeetham* and spirituality. The intention is to assess their wisdom on devotion, their knowledge on neuropsychological and their perception of God. The Electro-encephalography (EEG) rationalizes scientifically the spiritual characteristics of Swami Tyagaya's devotional *sangeetham* in association with the electrical activity in the brain. It also studies how modern Neuro-Psychology approves this "God- Image" in the brain? The statistical data and the EEG results provide subjective and objective evidences on the values of Tyagaya's devotional *sangeetham* and the brain. The survey findings are derived from four hundred and ten candidates who assisted to reveal their philosophical viewpoint of Swami Tyagaya, *sangeetham*, brain, God and spirituality. The statistical results show valuable positive correlation between each of them. This survey inference indicates that Swami Tyagaya's devotional *sangeetham* strongly influences the spiritual experience. The EEG experiment was conducted on thirty four volunteers divided into three groups. The Group A volunteers contemplated with Swami Tyagaya's sangeethem while Group B and Group C contemplated on devotional songs (not Tyagaya's *sangeetham*). The brain electrical signals of the three groups were compared with one another. The Group A volunteers showed significant increase of 100% Alpha activity and 83% Theta activity when compared with the control Group B and Group C. The Group A finding is inspiring and educative. The EEG results clarify the pattern and nature of devotion and identify the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God". The research successfully proves that the meditative nature of Swami Tyagaya's devotional *sangeetham* develops the experience of God in the human brain. This spiritual association can engage the society to activate compassion, love and tolerance. The conclusion is that the vision of God is a manifestation in the brain by a long term practice of devotional *sangeetham*. It appears that spirituality may be natural as described by Dr. Andrew Newberg, Swami Tyagaya and Swami Yatiswarananda. The research on *sangeetham* as a tool can be incorporated into schools for psychotherapy and into hospitals for health therapy.

ABSTRAK

Tiada kajian saintifik telah dibuat pada penggubahan muzik *Saint Tyagaya* dan kaitannya dengan mekanisma otak. Kajian ini bertujuan untuk menguji hipotesis bahawa meditasi *Sangeetham Tyagopanishad* boleh menghasilkan tindakbalas emosi yang unik di dalam otak dan membawa ke peringkat akhir "kesedaran Tuhan". Oleh itu, mentafsirkan *Sangeetham* sebagai amalan rohani menjana pengalaman "'Pembentukan Tuhan" dan dengan itu menyediakan akses kepada tahap rohani yang tinggi. Penekanan khusus diberikan ke atas pembentukan imej Tuhan seperti yang disarankan oleh Swami Tyagaya. Kajian ini menggunakan kedua-dua kaedah kualitatif dan kuantitatif untuk menganalisis dan membuat kesimpulan data primary dan sekundar dari kesusasteraan yang relaven, survey dan eksperimen *Electroencephalogram* (EEG). Kaedah kualitatif menekankan metodologi *Interpretative Phenomenological Analysis* (IPA) untuk pemahaman pelbagai kesusasteraan. Kaedah fenomenologi adalah berkesan untuk membawa pengalaman individu dari perspektif diri sendiri. Kaedah kuantitatif berkaitan dengan data kajian soal selidik dan eksperimen EEG. Kajian soal selidik merupakan prosedur subjektif untuk merasionalkan pandangan masyarakat terhadap Swami Tyagaya, *sangeetham* dan kerohanian. Tujuannya adalah untuk menilai kesedaran mereka terhadap pengetahuan kerohanian mereka, pengetahuan neuropsikologi dan persepsi mereka terhadap Tuhan. EEG merasionaklan secara saintifik akan ciri-ciri rohani *sangeetham* Swami Tyagaya yang ada kaitan dengan aktiviti elektrik di dalam otak. Ia juga mengkaji cara neuro-psikologi moden membayangkan "imej Tuhan" di dalam otak. Data statistik dan keputusan EEG memberikan bukti-bukti yang subjektif dan objektif kepada nilai-nilai *sangeetham* kerohanian Swami Tyagaya dan otak. Hasil kaji selidik itu diperoleh daripada 410 calon yang membantu untuk mendedahkan pandangan mereka terhadap falsafah Swami Tyagaya, *sangeetham*, otak, Tuhan dan kerohanian. Keputusan statistik menunjukkan korelasi positif di antara setiap elemen. Inferens kaji selidik menunjukkan bahawa *sangeetham* Swami Tyagaya amat mempengaruhi pengalaman kerohanian. eksperimen EEG telah dijalankan ke atas tiga puluh empat sukarelawan yang dibahagikan kepada tiga kumpulan. Kumpulan A merupakan orang yang biasa dengan *sangeethem* Swami Tyagaya manakala Kumpulan B dan C yang yang biasa dengan lagu-lagu kerohanian (tidak *Sangeetham* Swami Tyagaya). Isyarat elektrik otak daripada ketiga-tiga kumpulan telah dibandingkan. Sukarelawan Kumpulan A menunjukkan peningkatan yang siknifikan iaitu 100% aktiviti *Alpha* dan 83% aktiviti *Theta* apabila dibandingkan dengan kumpulan kawalan B dan C. Dapatan kumpulan A adalah merangsangkan dan memberi pengajaran. Keputusan EEG menjelaskan corak dan sifat kerohanian serta mengenal pasti pengaruh alam sekitar yang mewujudkan keadaan otak yang releks untuk menggambarkan Tuhan. Kajian ini berjaya membuktikan bahawa sifat meditasi *sangeetham* Swami Tyagaya mengembangkan pengalaman Tuhan di dalam otak manusia. Perhubungan kerohanian boleh mengembangkan sifat belas kasihan, kasih sayang dan toleransi dalam kalangan masyarakat. Kesimpulannya, "imej Tuhan" manifestasi di dalam otak dengan amalan *Sangeetham* pada jangka masa yang panjang. Terbuktinya kerohanian mungkin semula jadi seperti yang dinyatakan oleh Dr. Andrew Newberg, Swami Tyagaya dan Swami Yatiswarananda. Penyelidikan tentang *sangeetham* sebagai elemen yang boleh diperkenalkan di peringkat sekolah sebagai psikoterapi dan di hospital sebagai terapi kesihatan. Implikasi dan cadangan adalah penyelidikan lanjut dalam bidang *sangeetham* Swami Tyagaya dan komunikasi dengan Tuhan adalah perlu menggunakan percubaan terkawal dengan menggunakan Imbasan Pengimejan Otak seperti *Functional Magnetic Resonance Imaging* (fMRI) dan *Positron emission tomography* (PET).

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CHAPTER ONE

INTRODUCTION

1.1 Introduction and Background of the study

The function of this chapter is to introduce the overall viewpoint of the research. The research is associated with Indian classical music (*sangeetham*), Swami Tyagaya, brain, "God", neuro-psychology and spirituality. Each of the perspective has its own underlying literature, philosophy, scientific viewpoints, objectives, limitations, biases, methodology, findings and results.

From the genesis of Human history, ever since mankind started on his long journey along the path of development and civilization, music has had a very special charm on the human mind. It can very well be called the magic of sound and it has always been an important element in the culture of all tribes and all races. The way of life, their God, their mood, their nature and their history are predicted in the quality of their music. Their music represented their emotions like pleasure, pain, love, hatred, heroism, knowledge, marriage, birth, death and God (Prajnananda Swami, 1973:1). Music listening, performance and composition engages nearly every area of the brain and music is used to manipulate our emotions (Levitin, 2006:9). Generally, people lived in diverse situations, yet beneath the diversity there was an under-current of unity and music emerged as an important media for unity, for harmony and for devotional singing. Devotional singing like prayer is incorporated in music is a form

of meditation (Newberg, 2010:28). Evidence point out that meditation is an excellent exercise for maintaining an healthy brain (Newberg, 2010:27). Meditation involves sustained concentration and deliberate regulation of brain action and breathing. Many studies have shown that it enhances relaxation and spiritual well-being. (Newberg, 2010:160). Devotional singing in the form of prayer stimulates the cognitive circuits in the brain. From emotion perception to emotion experience: Emotions evoked by pictures and classical music. (Baumgartner, T. & Esslen, L. 2006). The circuits are Prefrontal cortex, anterior cingulated, basal ganglia and the thalamus (Newberg, 2010:28). Emotional responses to pleasant and unpleasant music correlate with activity in paralimbic brain regions. (A. J, Zatorre, 1999). Devotional music involves emotions and emotions are powerful energy which governs a wide variety of activities involved with consciousness, empathy, compassion, suppression of anger and fear (Newberg, 2010:28).

The creation of music is a product of intelligence. Music creates emotion and emotion generates a psychological relationship to the special brain areas. The devotional music like Swami Tyagaya's *Sangeetham* produces devotional emotions. The intense devotional sentiments can elevate the mind from the physical level to a metaphysical state. The Godly emotional sentiments dissolve the egocentric reliance and unify the devotional mind to the highest level of Divine contemplation. *Sangeetham* is one of the most powerful gateways to connect to the human spiritual sprit. It is believed to have divine qualities. The ragas influence the mind beyond the limits of intellectual state and to a higher blissful state. Carnatic *sangeetham* set alight the path of Swami Tyagaya's inner spiritual journey. Among the Indians, music is believed to have a divine origin because it has its roots in the supreme sound

which is known as *Sabta-Brahman* (Prajananda 1973;14). "I bow to Nada *Brahmam* and I bow to the seven swaras, *Sa*, *Ri*, *Ga*, *Ma*, *Pa*, *Dha*, *Ni*, with my mind and body of Tyagaraja" (Ramanujachari, 1958:288). Devotional singing and contemplation of God for long enough can cause different neural circuits in the brain to become activated new neurons and synaptic connections are made in the brain and God becomes neurologically real (Newberg, 2010:1). The devotional experience transforms God into a symbol representing a personal, ethical and social value. This emotional experience encourages a religious and spiritual development (Newberg, 2009:5). This form of spiritual development and contemplative singing exercise could strengthen neurological circuits involved with consciousness, empathy, compassion, love and tolerance (Newberg, 2010:17).

Music is a representation of cosmic harmony and a microcosmic representation of the macrocosm (Cook. N, 2000:75). Many sages have elevated their consciousness beyond all duality to realize the cosmic oneness through the love for devotional music. Faith in God drives the human spirit. Faith is embedded in our neurons and in our genes and it is one of the most important principles to honour our lives (Newberg, 2010:20). Devotional music increases neurologically the divine emotional perception of God. The combinations of meditational devotional singing and leading a righteous life can contribute to an atmosphere of spiritual elevation and celestial tranquillity. Music is an art form consisting of organized tones that produce a coherent sequence of sounds intended to elicit a pleasurable response in a listener. Vocal or instrumental sounds having some degree of rhythm, melody and harmony (Robert Ilson, 1985:1124). In sanscrit music is called as "*sangita*".

The Indian treatise on music has defined *sangita* as a combination of vocal, instrumental and dance. The Indians are of the view that music has its roots in the 'Supreme Sound'known as *Sabda - Brahmam* (Swami Prajnananda, 1973:14). Music that evolved in Indian soil and imbibed the spirit and atmosphere of spiritual India is known as Indian music or *sangeetham*. It possesses a devotional vision, a special grammar and a melodious character of its own. It differs from music of other countries in its structure, temperament and in its method of improvisation (Prajnananda, 1973:14). Spirituality has always been the prominent content of Indian Carnatic music. The beautiful blending of melody, rhythm, sacred lyrics and symphony has made Carnatic music extraordinary and divine. The basic idea behind Indian music compositions has been to see and seek the ultimate Brahman or God. In fact, it has been told in Hindu scriptures that the easiest and best way to attain salvation is to sing the greatness of their Gods. In Hindu scriptures, music and God have always been depicted together. Many deities have their own musical instruments. Lord Siva is the embodiment of Nada (cosmic music) which is the first form of music. Lord Krishna, the first of flautists, indicates his musical inclinations by the fact that he is the *Sama Veda* among the Vedas. Goddess Saraswati, the source of wisdom is always associated with the *Veena*. All Gods and saints are proficient in music and musical instruments.

Bhakti is a dedicated emotional commitment of love. *Bhakti* is intense love to God. *Bhakti*-Yoga is a genuine search of the Lord. It is a search beginning, continuing and ending in Love. Swami Tyagaya's extreme love to 'Lord Rama' brought him his eternal freedom. Swami Vivekananda said, "When a man gets it he loves all, hates none; he becomes satisfied forever and this love cannot be reduced to

any earthly benefit because so long as worldly desires last that kind of love does not come". (Swami Vivekanada, 1987:34). The *Bhakti* movement of South Indian was influenced by traditional religious concepts such as: temple rituals, pilgrimage and personal devotion. *Bhakti* is a devoted love for God. The mystical love for God was manifested in a personal capacity. Music played a significant role in the expression as nada yoga. scholars, poets and saints composed verses extolling God. Their *sangeetham* as poetic compositions became an integral part of the *Bhakti* movement. *Sangeetham* became significant and inspirational to express the love for their *Ishta devas*. Many conventional poets have contributed to this spiritual movement. The Hindu scriptures mention that *Nada* (music) is from the primordial sound *Omkaram* and is believed as the *pranava mantram* which the first form of devotional *sangeetham*. The prominent feature of Carnatic *sangeetham* is the spiritual essence of the *sruti*s, the *swara*s, the *raga*s, the *thala*s, the *dhoni*s, the *bhava*s, the *rasa*s and the *roopa*s. Many Tamil devotees like the sixty *Nayanmaar*s and the twelve *Alvar*s contributed their devotion and dedication to God and composed outstanding poetic compositions (*paasarangal*). Towards the end of the 16th century, the three prominent composers from the Tanjore district were Swami Tyagaya, Muthusamy Dikshidar and Syama Sastri.

Saint Tyagaya (1767 - 1847 AD) was the most celebrated Carnatic Music saint and was a great devotee of Lord Sri Rama. Tyagaya believed that God realization is best achieved through *Nadopasana* (music with devotion). His songs are filled with an intimate devotion to Lord Rama. He was a great teacher of mankind. He communed with God through music (Sambamoorthy, 2001:11). He comprehended the cosmic laws of divine music and through his compositions he enlightened the

compassionate nature of music. He advocated that the sacredness of *sangeetham* is beyond logical analysis but often comprehensible through personal intuition. (Sambamoorthy, 2001:85). All his compositions revealed his deep understanding of the doctrine of the Vedas, *Upanishad*s, *Purana*s especially the Ramayana. As a great devotee of Lord Rama, he insisted that Music and *Bhakti*, should be synonymous to realize God (Sambamurthy, 2001:11). Sri Tyagaya's life is an illustration to the saying that music and devotion combined make the best path to the understanding of the Supreme Brahman and attaining spirituality. He has composed several *Kriti*s in various raghas and his contributions to Carnatic *sangeetham* is immense. He has made unique contributions to the cultural growth of South India and even today his compositions (*kriti*s) are very popular among the students and lovers of South Indian classical music (Sambamurthy, 2001: 16). Swami Tyagaya is an example for the propagation of devotional *sangeetham*.

Devotional *sangeetham* activates a spiritual union with *Ishta Devata* (God). *Sangeetham* in general is love and harmony. Human beings are the successful species the world has ever known and hence there is definite likelihood that they will accept devotional *sangeetham* in their lives and promote love, compassion and tolerance. Mankind need to enjoy the melody, harmony, rhythm and the devotional language and employ it as a loving vehicle to worship God and propagate love, tolerance and peace. Society must take a quantum leap forward and associate to Swami Tyagaya's *sangeetham*, and spirituality. The devotional music is a form of meditation of a higher principle and it disciplines the mind against base emotions like felony, hatred, crime and sin. The consistent practice of devotional music causes neuroplasticity in the brain. The brain cortical centres produce divine emotions, perception, imagination,

thought and memory (Roth, 2004:36). Some societies like the Japanese Zen mediators, traditional South American people venerate music as a representation of Consciousness. Devotion to Consciousness is devotion to God. Divine emotions stimulate a creative motor- sensory system to motivate spirituality. Devotional music can transcends the limits of time and space and bring forth transcendental harmony and peace and comprehend the metaphysical aspect of God. The practise of devotional music can help the human society to be loving, tolerant, righteous and compassionate. Aristotle and Mozart were among those who did consider the songs of bird to be as musical as the compositions of humans (Levitin, 2006:258).

Spirituality is a process of personal transformation, either in accordance with traditional religious ideals, or oriented on subjective experience and psychological growth independently of any specific religious context. In a more general sense, it may refer to almost any kind of meaningful activity or blissful experience (Swami Vivekananada, 1987: 24, 65). In the Western civilization, spirituality and religion have become disconnected and spirituality has become more oriented on subjective experience *(https://en.wikipedia.org/wiki/Spirituality)*. The new development is that psychology, mystical and esoteric traditions and eastern religions are being blended, to reach the true self by free expression and meditation. The present development shows declining membership of organized religion and the growth of secularism has increased. These factors have given rise to a broader view of spirituality. Most of today's problems are from personal worries to social, economic and environmental issues which stem from human actions and decisions (Russell, 2003:119). Spirituality in Hindu philosophy is an individual experience, It is practiced as a spiritual journey towards *moksha* which is the awareness of the soul or the discovery of superior

cosmic truths or the true realization of consciousness. Hinduism identifies four ways of spiritual practice to realize the *moksha*. The first way is *Jnana yoga*, the way of knowledge. The second way is *Bhakti yoga*, the way of devotion. The third way is *Karma yog*a, the way of works. The fourth way is Raja yoga, the way of contemplation and meditation.

Sangeetham is the most admirabable theosophical art. Composers, performers and society often promote them, and listeners experience the devotional effects. The beautiful interweaving of the devotional element and aesthetics have made it ethereal and eternal. The saints, seers and composers of classical *sangeetham* have basically composed *kriti*s as a means of expressing their devout feelings and also to communicate with the "*Athman*" (soul). Swami Tyagaya said that the easiest way to attain salvation is to sing the greatness of the Almighty, Sri Rama (Sambamurthy, 2001:228). Music and singing are the most spontaneous form of human expression. The words of a song represent its rational basis, while the melody brings forth the sentiments concealed in the poetry. The poet-saint Swami Tyagaya composed his *Bhakti* verses in melody and sang them before the alter of Lord Rama every day.

The effectiveness of his spiritual exercise and the sure attainment of the goal rested on his visualization of Lord Rama. This fundamental quality advanced his spiritual urge. Therefore, Tyagaya's *sangeetham* has been tested and found the most satisfactory tool as it attracts, enchants, enthralls and easily appeals to all segments of the society. Swami Tyagaya's *sangeetham* when presented to God as an offering, inspires the person and the devotional excitement therein. It gives rise to a torrent of tuneful outpourings. It awakens the consciousness for the divine energy and sensitizes

to the holy message. *Sangeetham* has historically given unity to Indian civilization. The religious and philosophical unity has initiates compassion and love to all mankind.

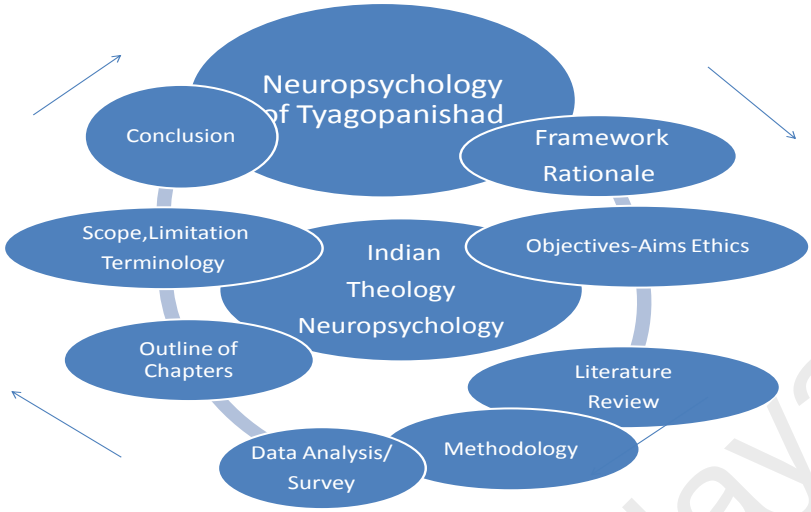
Many neuropsychologists, (Dr A. Newberg 2010, Dr O.Sach2007, Dr D Livitin 2006, Dr A Patel 2008) and other neurologists A. J, Zatorre, Dr Yuan Pin Lin, Shapiro, BR Cahn and others) have examined the spiritual experiences of the brain functions during singing devotional songs, chanting mantras and meditation. Some positive finding proves that certain neurotransmitters and specific areas of the brain are involved in the spiritual experience. Moreover, experiments have also successfully induced brain changes in individuals by meditation, chanting, devotional singing, prayer and yoga. These results have led to some neuropsychologist (Dr Newberg and Dr Ramachandran 2012) to speculate that spirituality may be induced artificially in the brain centres. In keeping with the growing scientific interest in spirituality and devotional songs particular results have been detected on the behavioral patterns of human beings. Their (Newberg. 2010, Livitin. 2006) research findings have led to suggest that spirituality might protect the devotee's' mental health and manifest love, compassion, righteousness and tolerance. Human anterior and frontal midline theta and lower alpha activity reflect emotional positive state and internalized attention: High-resolution EEG investigation of meditation. (Aftanas, L. I, and Golocheikine, S.A. (2001). This implies that spirituality may result from positive emotionality, higher well-being and a sociable disposition.

Neuro-psychologists (Newberg, 2010, Livitin, 2006, Davidson Richard 1988) believe that they have discovered a "God module" in the brain which could be

responsible for man's evolutionary instinct to believe in God and religion. Proponents of neurotheology say that there is a neurological and evolutionary basis for subjective experiences traditionally categorized as spiritual or religious experience. Neurotheology attempts to explain the neurological basis for religious experiences, such as Spiritual awe, Oneness with the universe, euphoric trance and sudden enlightenment. The Brain scans fMRI and PET or EEG shows more activity in the right ventro-lateral prefrontal cortex region and temporal cortex denoting spiritual emotional experiences, whereas less activity in the amygdala, a brain region involved in emotional processing of anger and fear was calmed (Dr. Simon Moss, 2016; Cahn, J. Polich 2006, Andrew Newberg, 2010:2). Additionally, some studies have reported beneficial effects from spirituality in the lives of patients with schizophrenia, d epression, and other psychological disorders. Some studies also reported the *sangeetham* may be used as a health therapy. (Andrew Newberg, 2010, Ramachandran 2012). Emotional responses to pleasant and unpleasant music correlate with activity in paralimbic brain regions (A. J, Zatorre,1999).

In summary, science seems to indicate to the society that meditation through *sangeetham* or chanting creates some form of spirituality which is beneficial for physical, mental and social health.

Summary Chart of Chapter One



1.2 The Hypothesis and Statement of Problem

The hypothesis is that the meditative *Sangeetham* of *Tyagopanishad* can produce an unique spiritual response in the brain and the imagery of Lord Rama is experienced (Sambamoorthy, 2001). The statement of problem describes the topic and the different issues and the methods to solve the predicaments by answering who, what, how, where, when and why. The clarity of the issues help to solve the problem for the study.

The literature search denotes that no study has been attempted on *Tyagaya*'s musical compositions and the direction of *Bakthi*, (devotion) in the fulfillment of the realization of Brahman, the Absolute Consciousness or God. The comprehension of Brahman or God is an unsolved mystery of life. Indian devotional musicological treatises incorporate the theory of sacred sound as *Nada-Brahman*. *Sangeetham* is derived from *Brahma-nadam* and it has a profound impact in the brain. Thus,

interpreting that meditational music as a spiritual practice directly manifests a 'God Form" experience and therefore provides an access to the highest spiritual reality.

This study will demonstrate through an EEG research on devotional *sangeetham* and the brain. The study will prove the relaxed brain electrical activity under the influence of Swami Tyagaya's *sangeetham*. The results will presume which brain cortex can contribute to divine activity "God" as an emotional expression. The study also shows through a questionnaire survey how the society judges about *Sangeetham*, Swami Tyagaya, neoro-psychology, God and spirituality. These vital findings will show the positive elements of Swami Tyagaya's *sangeetham* in realizing God. The study will explain that intense devotion is the key substance for the meditational consequence of Carnatic *sangeetham*. The consistent interweaving of the devotional element and experiential knowledge makes *sangeetham* delicate and perpetual.

The basic idea behind compositions has been to see and seek God. In fact, it has been said that the easiest way to attain salvation is to sing the greatness of the Almighty. This spiritual musical practice (*sadhana*) culminates in inner peace, righteousness, compassion, forgiveness, love, patience, humility, tolerance and happiness. Spirituality is centered on personal well-being, psychological advancement and moral personality. Swami Tyagaya's devotional musical compositions have a meditational consequence in the realization of God, Lord Rama. The devotional music of *Tygopanishad* tends to reinforce serenity and spirituality in the brain. The philosophy of Swami Tyagaya is to infuse positive religious ideas to the *brain centres* and insures the brain to recognise a "Divine Power". It is a spiritual

emotion exhibited in the mind as "God Rama". The brain has the profound capacity to respond to the meditational value of devotional *sangeetham*.

1.3. The Objective of the Study

i. To examine and demonstrate that Swami Tyagaya's devotional *sangeetham* plays a prominent role in the emotional centres (Limbic cortex- amygdala, hypocampus, procuneus) of the brain and creates a visual imagery of 'God'.

ii. To establish that the present society is sensitively favorable to devotional music, spirituality and God. This exercise is carried out through a questionnaire survey and to demonstrate how to attain this spiritual status and what is the benefit of spirituality to the society.

iii. To analyse the way the modern Neuro-Psychology illustrates "God-Image" in the brain and to study through the EEG, the dynamics of the brain.

iv. To examine what devotional *sangeetham* can teach us about the brain and what the brain can teach us of spirituality?

1.4 Rationale and Justification

The main rationale is find information that can give some relevant ideas of how to prove that devotional *sangeetham* can contribute the feeling of God in the brain. The study mainly enlightens the general perception of devotional *sangeetham*, the brain and Spiritual experiences. The study shows a method towards an empirical

research on devotional *sangeetham* and its reflection in the brain. The research conveys that the brain physiological factor can contribute to divine emotional expression of "God". The study conducts a questionnaire survey to know how the present society value *Sangeetham*, Neoro-psychology, God and spirituality and conducts the EEG experiment to learn about the brain electrophysiology when under the influence of Swami Tyagaya's *sangeetham*.

i. The study justifies how Tyagaya's devotional musical compositions have a meditational consequence in the realization of God, Lord Rama and justifies Swami Tyagaya's vision of God and substantiates his devotion through music.

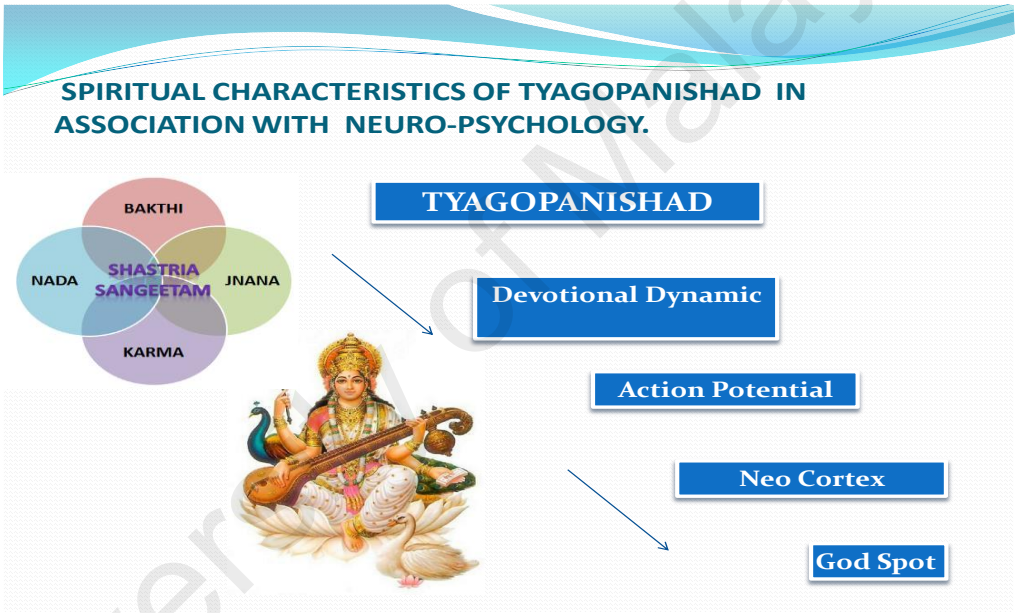
ii. To justify the scientific believe that Neurologists have discovered a "God module" in the brain which could be responsible for man's evolutionary instinct to believe in religion and spirituality. Neuro-science reveals about the effects of meditational music in the brain and how the neuro-transmitters (serotonin, endorphin, dopamine) and electro-chemical charge (Sodium+ charge) stimulate the brain. The transformation of the brain neocortex is responsible for man's evolutionary instinct to manifest the "God module" through the mechanism of neuro-splasticity.

iii. The study justifies Tyagaya's devotional music brings about the realization of God, through years of devotional practice which enhances personal moral values.

iv. The study rationalizes through the Electoencephalography & the Questionnaire survey how Devotional emotions are mediated to manifest spiritual pleasure that *Swami Tyagaya* experienced which can elevate the spiritual status in the society.

v. To justify that spiritual practice (*sadhana*) culminates in inner peace and happiness. This spirituality is centered on personal well-being, psychological advancement and moral personality such as righteousness, compassion, forgiveness, love, patience, tolerance and altruistic values.

vi. The comprehension of Brahman or God is an unsolved mystery of life. No study has been attempted on devotional music and the direction of meditational importance in the brain regarding the perception of God and spirituality.



The theoretical association of Swami Tyagaya's *sangeetham* to spirituality and the God spot in the brain

1.5 Primary Research Questions

The research questions of the study is intended to establish a new line of theory, it should make clear what that new theory is, how it relates to existing theories and evidence, why the new theory is needed, and the intended scope of its application. The study questions how Tyagaya's devotional music teaches about the realization of *Brahmam* and how science reveals about the effects of meditational music in

the brain? Therefore, the study answers some basic research questions. How and why did Swami Tyagaya have religious experiences? How does Tyagaya's devotional *sangeetham* construct in the brain centres? What are the dynamics of the brain? Is it purely inexplicable emotional outburst or neurological or psychological disorders? Is there truly sensory centres specialized in recognizing emotional or Spiritual (Godly) subjects in the brain cortex? Can this issue be proved on empirical grounds? What is the status of modern Neuro-Psychology here? What are the salient neurological pathways and what are the scientific experiments to corroborate music's spiritual encounters? What does the society feel about Swami Tyagaya's *sangeetham*, meditation, brain and spirituality? How does the musical spirit of *Tyagopanishad* as a spiritual practice create compassion and suppress anger and violence in the modern society?

Studying the complex and characteristic response to music and the dynamism of the mind is challenging because it involves the mystifying and dynamic regions of the Brain-Mind-Brahman complex.

1.6. Statements on Swami Tyagaya, music, brain & spirituality

1.6.1 Swami Tyagaya

Swami Tyagaya has quoted in many of his poems about his divine experience. The poems are 1. *Ella ni daya rathu*, 2. *Kannukontini, Giripai*, 3. *Inthakannu*, and 4. *Nannu palimpa* (A. K. Gopalan,2003; 13). Swami Tyagaya defines in the *kriti* "*Sogusuka mridanga taalamu*" that the *kriti* in the *nadam* expound the exalted words of the Upanishads which are marked by correct placements of *sruti*, *swara*, *raga* and *tala* for melody and harmony. It reflects true

devotion, divinity and *vairagya* and dripping with the juice like grapes rich in nine *rasa*s (Ragavan, V., 1958:36).

1.6.2 Brain and Music

Music has a neurophysiology perspective which affects our brain, our thoughts and our spirit. The fundamental building blocks of music are pitch, contour, tempo, timbre, loudness, spatial location and reverberation. Our brain organize these fundamental perceptual attributes into higher level concepts (Daniel Levitin, 2006:4).

Neurophysiological meditative state and trait effects are variable Psychological and clinical effects of meditation are real (BR Cahn, J Polich - 2006).

"Musical sound waves impinge on the ear drum, setting off a chain of mechanical and neuro-chemical events, the end product of which is an internal mental image (Daniel Livitin, 2006:22).

"Every human, from early childhood on contemplates the possibility that spiritual realm exists in the brain" (Andrew Newberg, 2010:8).

"The longer and more intensely and frequently you practice the more changes are noticed in the brain and have meaningful experience of God" (Andrew Newberg, 2010:119).

Eric Kandel, the Nobel price, German neuropsychiatrist says "Neurons never stop learning-Neuroplasticity". Kandel showed that when any alteration in the environment occurs, the nerve cells will change in a matter of time. When the stimulus around is altered, the internal function of the nerve cells change and is capable of communicating with others parts of the brain cells. (,Andrew Newberg, 2010:15).

During the baseline condition with closed eyes she showed substantially more Alpha activity in the prefrontal area than most persons, and the Alpha activity was more evenly distributed over the whole brain (Erik Hoffmann, 2001).

The voluntary descent into the unconscious was reflected by strongly increased Alpha and Theta activity widespread in the brain. During the arousal of *Kundalini* energy on command, our subject's two frontal lobes were activated and their Gamma brain waves were hyper-synchronized (Erik Hoffmann, 2001).

The analysis of the data was performed in both alpha and theta bands. Consistent with existing findings, the results in alpha band confirm the hemispheric specialization hypothesis for emotional valence (Konstantinos Trochidis 2012).

Moreover, theta asymmetries observed between pleasant and unpleasant musical excerpts support the hypothesis that theta power may have a more

important role in emotion processing than previously believed (Konstantinos Trochidis 2012).

According to Newberg, "If you contemplate something as complex and mysterious as God, you are going to have a burst of neural activity (Andrew Newberg, 2010:14).

1.6.3 Spirituality

"Spirituality strives for transformation of character which results in moral purity and strive to transmute the *tamas* (animal) and the *raja*s (man) into the *sattva* (God) to lead us to the realization of the Supreme Spirit" (Swami Yatiswarananda, 1998:485). Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward, emotion and spirituality (Blood, A. J. & Zatorre, R.J., 2001).

"Spiritual practices bestow a sense of peace, happiness and security while decrease symptoms of anger, anxiety, depression and stress." (Newberg, 2010:34).

1.7 Theoretical Framework & Theoretical Evidences

The theoretical framework explains the main components of the study and the presumed relationship between them so that the components are consistent (Miles, 1994:18). It identifies the main subjects and their associations. The statement of problem, the research questions, the research design and the research purpose which are beneficial to the theoretical framework.

(Researcher)

1.7.1 Theoretical Evidences on Swami Tyagaya and *sangeetham*

Swami Tyagaya took great delight to sing the *Pancharetna kriti*s during the *unchavriti bhajan*s. The composition "*Endaro mahannughaavulu*" is noted for fine poetic imagery and philosophic message. Swami Tyagaya applied *Sangeetham* as an excellent tool to propagate Sri Rama *Bhakti*, (devotion to Lord Rama-God). He personified *Sangeetham* to *Nada-Swarubam* and *Nadam* to *Brahma-Swarubam*.

In the *kriti*, "*Jagadanatha karaka*", Swami Tyagaya eulogises Lord Rama as the cause of all creation. He envisioned Lord Rama which is mentioned in his poetry. Tyagaya was determined that through devotional, *Bhakti Yoga Nada yoga* and *Nishkamia Karma*, (attributeless action), the Brahman can be realized, (*moksha*). Tyagaya believed in the service of fellow men through love and compassion it is a spiritual service to *Ramabakti* (P. Sambamurthy, 2001:40).

1.7.2 Brain-Mind Dynamics on God and Neuropsychology

The Machinery in the Brain are sound vibrations in the Ear, Neurotransmitters, Creative cortical centres, plasticity and Temporal and visual imagery. Scientific Experiments with EEG, fMRI & PET findings show correlations in the brain to Limbic cortex (BR Cahn, J Polich, 2006). Brain Synchronization enhances Spiritual Emotions in the Limbic system (Newberg, 2010:67).

i. If the mind is set on reaching a spiritual goal, the neurons will enhance the sense that a spiritual reality can be experienced. Abraham, Moses, Jesus, Mohammed and Buddha all reached spiritual enlightenment because they devoted years to intense meditation and prayer (Newberg, 2010:95).

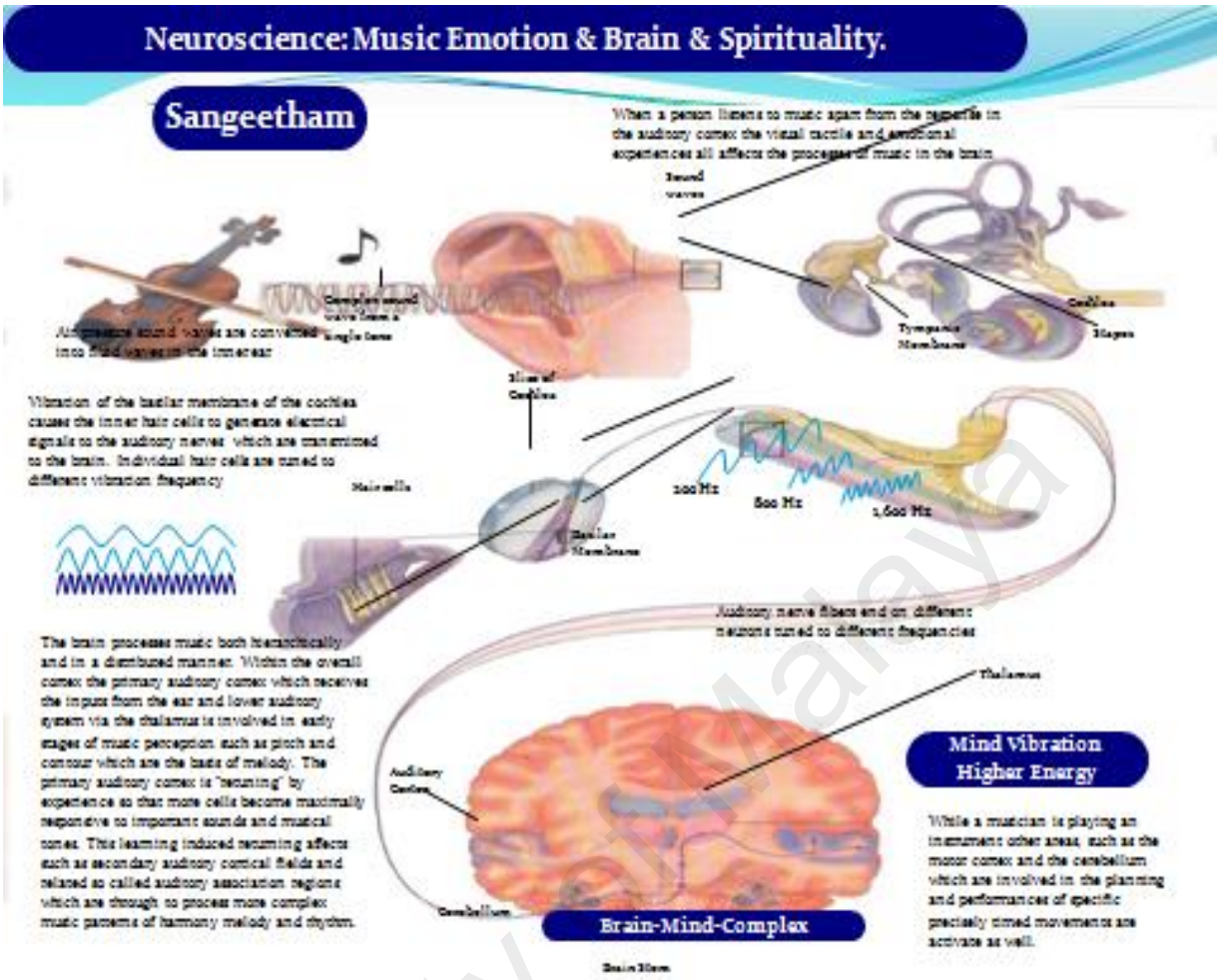
ii. For example, the occipital lobe helps to envision 'God", the temporal lobe aids to hear the 'Lord', the frontal lobe and parietal lobe helps to imagine the '*Ishwara*' and the amygdale is involved in the emotion and the hypocampus in storage of the memory of 'God experience' (Newberg, 2010, p.43) The pineal gland produces melatonin, a serotonin derived hormone and the cerebellum are involved with the emotional relationship of the spirituality (www.crystalinks.com, Levitin, 2006:163).

iii. The Theoretical Evidences for Neuropsychology and Vedantic philosophy is described by (Newberg, 2010) Swami Yatishwaranada in his book "Meditation and Spiritual Life", 1998. Dr Daneil Levitin speaks of psychology of music in his book, "This is your Brain on Music, 2006.

iv. Neuro psychology experimentation (Blood, A. J. and Zatorre, R.J. (2001). proves that music (*Sangeetham*) sensibility sends neurological potentials through the neural circuits which activate new dendrites and synaptic connections causing spiritual emotion. This subtle neural stimulation of the brain activates the perception of the experience and the mind exhibits the neurological phenomenon of the God (*Brahmam*). Thus, the spiritual sensation of 'God' becomes neurologically real. The meditational sound vibration throws light on the complex formula of cognitive-perception-realization system in the brain (Stiles. J., Andrew Newberg, 2010:31).

v. The brain has the profound capacity to respond to the meditational value of devotional music. It is a spiritual emotion exhibited in the mind as "God". Scientific studies show this transformation in a number of brain imaging investigations and in on line survey of spiritual experiences (Konstantinos Trochidis, 2012, Daneil Levitin, 2006:163).

vii. The mind is to be developed. The will is to be developed. Thoughts and feelings are to be developed. Only then comes the question of transcending the mind to spiritual level (Swami Yatishwaranada, 1998:314).



(Singing in the Brain. https*://tackk.com/the-amazing-power-of-music*)

1.8 The Purpose of the study

The study reasons recent advances in neuroscience towards devotional music, religion and spirituality. It explains the holistic nature of religion and science. It recommends that through devotional *sangeetham*, substantial physical and mental health benefits are derived. (e.g. closeness to God feeling, religious orientation and motivation, religious support, compassion, tolerance and righteousness). The study points out areas for growth in science, religion and spirituality and that the Neuro-Psychologists are discovering distinctive brain areas to understand God. It recommends Swami Tyagaya's *sangeetham* to create a healthy society and world peace.

1.9 The Significance of the study

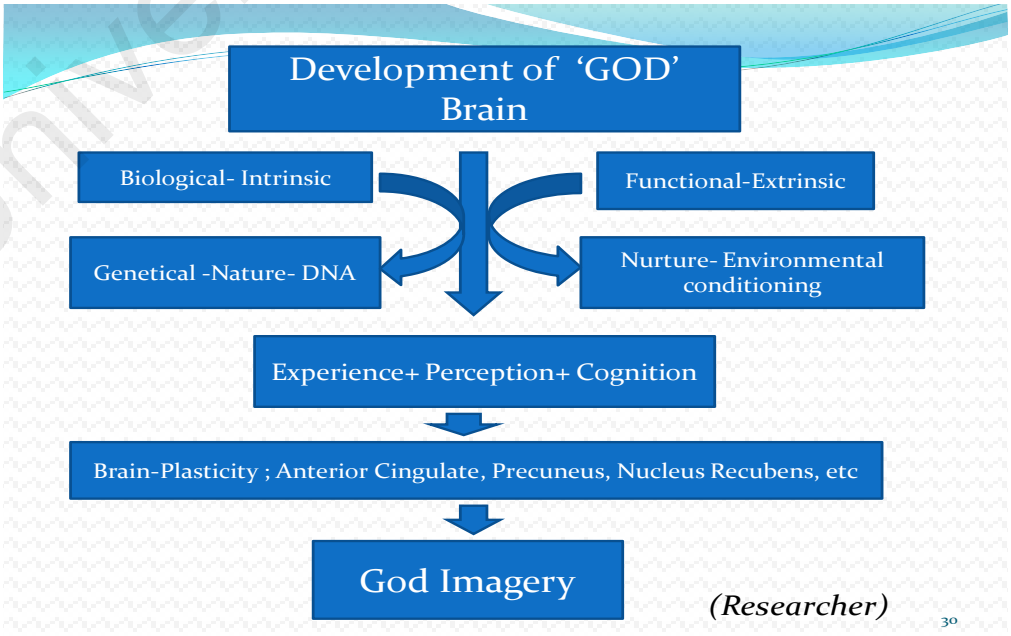
i. Devotional *sangeetham* can enhance specific neural activity for God sensation. There are spiritual perception centres in the neocortex of the brain where the neurons comprehend God.

ii. Swami Tyagaya's visualization of God Rama can be real because the brain can create a visual imagery of God. Modern neuroscience explains through brain imaging methods and EEG techniques the brain dynamics.

iii. The EEG investigation helps to understand the brain better. The data predicts the relaxed brain activity in the emotional centres thus producing a divine awareness.

iv. The general survey data assists to realize the society's spiritual dimension and knowledge. It points out that Spiritual life and God realization signifies tolerance righteousness, compassion, humility, and love.

v. Swami Tyagaya's devotion and his message denotes that spirituality is one's journey towards moksha which is the awareness of self, and the true nature of reality.



1.10 Research design & the line of investigation

The study begins with an explanatory design which is important to be clear about the role, purpose and the line of investigation of the research. The study understands the hypothesis, the theoretical framework and the research process. The line of investigation is by qualitative analysis of the literature and quantitative analysis of laboratory and survey research. The current study relies largely on qualitative and quantitative methodology for data collection. In the qualitative methodology, the current literature reviews are designed to test the hypothesis that the meditative *Sangeetham* of *Tyagopanishad* could produce an unique spiritual response in the brain. The Two quantitative methodologies are used to a wider extent. The first in the form of subjective Questionnaire survey and the second in the form of an empirical EEG experiments were conducted.

The main design of the thesis is to use a qualitative analysis of vast literature reviews on *sangeetham*, Swami Tyagaya's compositions, neuro-psychology books and books on Vedanta. The reason for doing so is to get in-depth understanding of the responses from the qualitative subject of *sangeetham* and the brain. The qualitative subject is endorsed through literature evaluations of famous scientists and the personal experience of the researcher as a doctor and musician. The study enables better understanding of Saint Tyagaya's *sangeetham*, devotional music and neuro-psychological subjects.

The quantitative methods endorse subjectively by the Questionnaire survey methods and electrophysiologically by laboratory Electro-Encephalogram

investigations as a neurological investigation. The survey investigates a random probe as well as triangulation of responses of the background of devotional *sangeetham*, Saint Tyagaya, brain, spirituality and neuroscience. 'Random probes provide a check on the validity of questions and yield a representative sample of verbatim comments which can be used as illustrative quotations when writing-up the research' (Gilbert, 1993:42). "They are useful and they provide illustrative material about what underlies in the justification of the thesis (Gilbert, 1993:42). However, the qualitative literature analysis followed by quantitative survey and EEG investigations would endorse stronger evidences and propose new recommendations. These evidences will be useful for the study and for future researches.

Therefore the researcher prefers to discuss the combination of both qualitative and quantitative findings in order to benefit from the advantages of both the investigations. As Philip (1998) argues, 'employing a range of methodological strategies means that the researcher does not necessarily privilege a particular way of looking at the social world. I would suggest that such diversity encompasses methodological plurality as well as postmodernism encouraging different voices to be heard and facilitating the exploration of different truths' (Seale, 2004:296) and according to Bryman, they each have distinctive characteristics that make the possibility of combining them especially attractive' (Seale, 2004:296).

The subjects of the current study are essentially, *sangeetham*, Swami Tyagaya's devotional compositions, Neuropsychology and spiritualism which are the combination of Theo-philosophy and science. The complexity of the study necessitates the combination of different methods to avoid possible misinterpretation

of responses and barriers which may be considered as the limitation. However, the methodology adopted in this study is both conceptual and empirical. These guide line methods endorses to understand and discuss the relationship between devotional *sangeetham,* Swami Tyagaya, spiritual experiences and the associated dynamics in the brain. An important contribution that exploratory research can make to our understanding is helping us to identify patterns and enabling us to give names to social phenomena (Thomas, 2000:170).

The discussion is benefitted by the application of Interpretative Phenomenological Analysis (IPA) for the Qualitative methodology. IPA has its theoretical origins in phenomenology and hermeneutics. Phenomenological methods are particularly successful at bringing to the fore the experiences and perceptions of individuals from their own perspectives. The interpretive dimension enables it to be used as the basis for practical assessment. The hermeneutic research emphasizes on the metaphysical stance, methodological grounds, quality concerns and ethical issues that contribute to its paradigmatic assumptions. Finlay (2009) further states that applied to research, phenomenology is the study of phenomena: their nature and meanings. The focus is on the way things appear to us through experience or in our consciousness where the phenomenological researcher aims to provide a rich textured description of lived experience. (Hermeneutic phenomenological research method simplified (Narayan Prasad Kafle, 2011:181). This phenomenon has made the study feasible in relationship to the enigmatic brain and the complex metaphysical interpretation.

Therefore, the analysis and discussion of the literature review, the survey and the EEG offers the development that will enable better understanding of Swami Tyagaya's devotional *sangeetham* and neuropsychological implication. It provides an in-depth understanding of the responses from the quantitative method about the qualitative subject. The qualitative subject is endorsed through literature reviews while the quantitative methods of Encephalogram investigation and questionnaire survey method support as a random probe the responses of the society on *sangeetham,* Swami Tyagaya, brain and spirituality. Random probes provide a check on the validity of questions and yield a representative sample of verbatim comments which can be used as illustrative quotations when writing-up the research (Gilbert, 1993:42).

However, qualitative analysis of literature review and the quantitative analysis support the objective and the rationale of the thesis. The discussion attempts at a detailed explanations of responses that emerge from the questionnaire survey and the neurological investigations. Therefore, the researcher opted to combine methods (qualitative and quantitative) in order to compensate for the inadequacies and benefit from the advantages of both of them. The discussion is based on the survey findings collected from random members of the Indian society across the country. The survey data explains devotional *sangeetham*, brain, neuropsychology, God and spirituality. The EEG experiments explains the brain wave patterns of the three groups of volunteers.

The results of the discussion denotes that the data collected from the survey and the EEG signals show positive public perception on devotional *sangeetham,*

Swami Tyagaya, mediation, brain science and spirituality. The discussion of the EEG infers that in this modern era, science can be used as a valuable tool to explore the dynamics of the brain towards spirituality. The concept associated with Swami Tyagaya's devotional *sangeetham* and spiritual dimension in association with the brain indicates inspiring knowledge about the architecture and physiology of the brain. The EEGs certainly indicates classified electrical signals in relationship to the input of devotional *sangeetham*. It proves that the emotional processing in the special brain centre (amygdale) focuses 'God Realisation'. Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion (Blood, A. J. and Zatorre, R.J. 2001).

The researcher provides important illustrations throughout the study about *Sangeetham*, Swami Tyagaya, God, Brain and spirituality. The main subjects of the discussion are essentially in Swami Tyagaya's devotional *sangeetham*, Neuropsychology and spiritualism. The discussion and inference of the complex study necessitated the combination of three different methods (qualitative, survey and EEG) to substantiate the rationale and the objective of the thesis. The overall discussion proves the four objectives of the thesis. Bryman (2001) has argued that research methods are rooted in epistemological and ontological commitments. The epistemological positions in which the two methods [quantitative and qualitative] are grounded constitute irreconcilable views about how social reality should be studied (Seale, 2004:294).

The first guideline of literature review fulfills the first and fourth objective of the study and the second guideline of survey fulfills the second objective and the third guideline of EEG fulfills the third objective of the study.

1.11 The Elaborate Plan of study

i. Development of the foundation of *Sangeetham* and its sacred connection to the Vedas.

ii. Explanation of the saintly life of Swami Tyagaya, the divine message of devotional *Sangeetham*, *Bhakti Yoga*, *Tyagopanishad*, *Saadana* and the vision of Lord Rama.

iii. The Dimension of sound vibration in the Brain auditory cortex, the properties of Neuroscience and spiritiual science, *Tyagopanishad* and its emotional impact and the transformation of the consciousness level.

iv. *Tyagopanishad*'s Spiritual effects, Scientific Researches on the brain and Neuro-Psychology.

v. The Demographic, qualitative and quantitative analysis of the perception of Swamy Tyagaya's devotional *sangeetham*, brain, God and Spirituality by means of the Questionnaire. An Electroencephalography (EEG) experimentation to estimate the spiritual transformation.

vi. Discussion and Conclusive related to Swami Tyagaya, *Tyagopanishad*, Bhakthi, *Sangeetham*, Dyaana, Yoga, Neurotheology, Neuropsychology, God Factor and Spiritual transformation.

1.12 Review of Literature on *Sangeetham*, Swami Tyagaya, Neuropsychology and Electoencephalography EEG.

The purpose of the review of literatures is for theoretical and methodological contribution of the knowledge to the current study. The literatures are classified, analyzed and summarized for evaluation to provide insight for the present study. The inconsistencies are taken note. The reviewed literatures include books on *Sangeetham*, Vedanta, Swami Tyagaya spirituality and Neuropsychology.

Literature on *Vedanta* & *Sangeetham*

Swami Prajnanananda, explains the systematic study of Indian music. The two important books referred are 'History of Indian Music Book 1 & 2' (1998) and 'Historical Development of Indian Music' (1973). P. Sambamurthy, explains the philosophy of Shastria *sangeetham* and writes the Life and compositions of Swami Tyagaya. The books referred are 'History of Indian Music' (1994), P. Sambamurthy extensively researched in the work of great poets of South India "Great Composers" Book One & Two (2001).

Sri Ramanujchariar and V. Ragavan enlightens about the varied qualities of Tyagaya's literary work in their book called "The Spiritual Heritage of Tyagaya (1958). Swami Yatiswarananda clarifies on Vedanta in the book, "Meditation and Spiritual Life" (1998) is a compilation of spiritual facts on Hinduism.

Paul Deussen in his book, "Philosophy of Vedanta" (2007) discusses on the philosophy of Vedanta and its relationship to modern times. Swami Prabhavananda,

in the book, "*Patanjalli Yoga Sutra*" (2006), talks of control of meditation and thought waves in the brain.

Neurology & Neuropsychoplogy:

Andrew Newberg elucidates in his book, "How God Changes your Brain" (2010) about the study of brain changes in meditation and prayer. He speaks about the God module in the brain.

Peter Duus in his book "The Diagnosis in Neurology" (1989) describes about the anatomy and physiology of the brain inclusive of EEG, psychiatry, neuro-imaging, neuropathology and psycho-neuro-immunology.

Oliver Sacks explains about the effect of music on emotions and cognation in his book "Musicophilia" (2007). He explores the links between the brain and human experience.

Daniel J Levitin, explains the theory of music and the brain. In his book "This is Your Brain on Music" (2006).

Vilayanur Subramanian Ramachandran talks in the fields of behavioural neurology and visual psychophysics. His books are "Phantoms In the Brain" (2012) The Tell-Tale Brain (2010).

John Rogers Searle contributes to the philosophy of language, philosophy of mind , and social philosophy in his book, "Freedom and Neurobiology" (2004).

Electoencephalogram (EEG)

Analysis of evoked EEG synchronization and desynchronization in conditions of emotional activation in humans: Temporal and topographic characteristics (Alfanas, L .I., Reva, 2004).

Hits to the left, flops to the right: different emotion during music listening reflected in cortical lateralization patterns. (Altenmueller, E., Schuermann, 2002).

From emotion perception to emotion experience: Emotions evoked by pictures and classical music (Baumgartner, T., Esslen, M. and Jaencke, L., 2006).

EEG dynamics according to subject self-reported emotional states during music listening. The identified features were primarily derived from electrodes placed near the frontal and the parietal lobes, consistent with many of the findings in the literature. This study might lead to a practical system for noninvasive assessment of the emotional states in practical or clinical applications (Yuan-Pin Lin, Chi-Hong Wang, Vol. 57, No 7, July 2010).

Electroencephalographic measures indicate an overall slowing subsequent to meditation, with theta and alpha activation related to proficiency of practice. Sensory evoked potential assessment of concentrative meditation yields amplitude and latency changes for some components and practices (BR Cahn 2006).

Neurophysiological meditative state and trait effects are variable. Psychological and clinical effects of meditation are summarized, integrated, and discussed mediation, EEG, ERP, fMRI Index Terms Evoked Potentials, Meditation, Neuroimaging, Cerebral BR Cahn, J. Polich (Psychological bulletin, 2006, psycnet.apa.org).

One study that examined a variety of meditation techniques tried to show that alpha blocking was affected by the long term practice of meditation by testing response to auditory stimuli. *Becker DE, Shapiro D (1981). "Physiological responses to clicks during Zen, yoga, and TM meditation". Psychophysiology.*

The spectral power and coherence of EEG define delta, theta, and alpha frequency bands to characterize different meditation states. (Brain activity and meditation, Cahn 2006.

Many studies on mindfulness meditation, assessed in a review by Cahn and Polich in 2006, have linked lower frequency alpha waves, as well as theta waves, to meditation. Brain activity and meditation (Cahn, 2006).

It was observed that those who had well marked Alpha activity in meditation confirmed type results of study by Kasamatsu A and Anand BK et al who observed a

proponderance of Alpha waves of Yogic indicating a more relaxed state of mind (Sundarachari R., et. al, 2013).

Individuals with number of years of more experience in meditation have shown more Alpha activity than those with no experience in meditation (Sundarachari R et. al, 2013).

The EEG changes of lowered consciousness states that the persistent appearance of alpha waves indicates the brain function at the time of lowered vigilance. (An Electroencephalographic Study on the Zen Meditation (Zazen) (Akira Kasamatsmu and Tomio Hiram, D. 1966: 33).

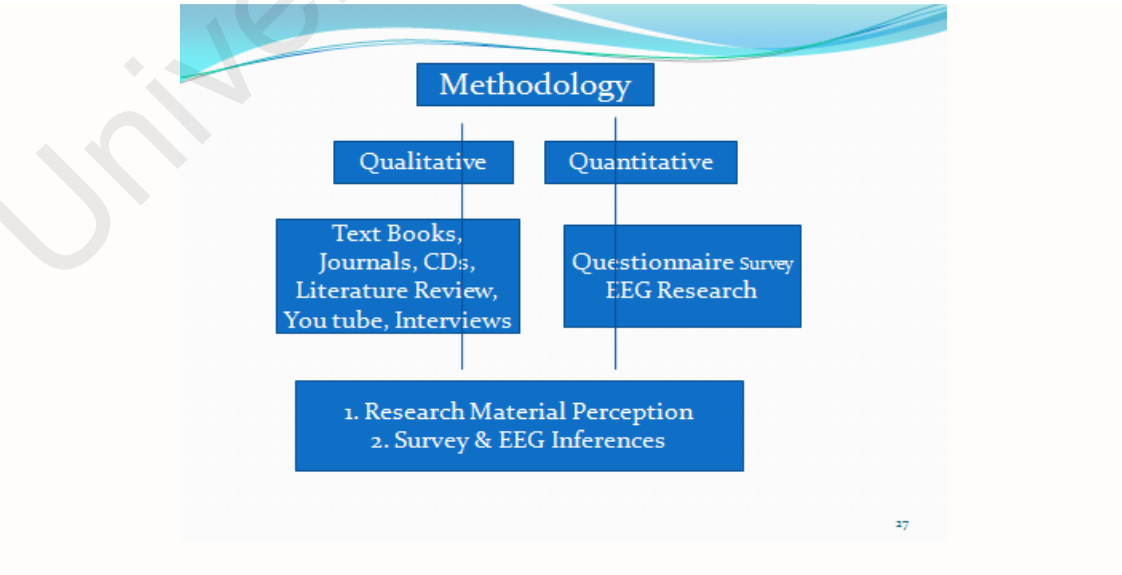
MihaiPopescu. AsukaOtsuka Andreas (2004). A Dynamics of brain activity in motor and frontal cortical areas during music listening: a magnetoencephalographic study; Laboratory for Human Brain Dynamics, Brain Science Institute, RIKEN, Wako, Saitama, Japan. NeuroImage, Vol. 21, Issue 4, April 2004: 1622-1638).

1.13 Methodology

The objective of the methodology is to understand the foundation of this study by demonstrating through qualitative and quantitative methods that Swami Tyagaya's *sangeetham* plays a prominent role in the emotional centres of the brain by manifesting a visual imagery of God and also assesses how devotional *sangeetham*

can create spiritual society. The methodology proves how modern Neuropsychological experiment approves this “God-Image "in the brain?

Bryman (2001) has argued that research methods are rooted in epistemological and ontological commitments. The epistemological positions in which the qualitative and the quantitative are grounded constitute irreconcilable views about how social reality should be studied (Seale, 2004:294). The distinction of methodology is to recognize and destabilize the conflicting views. (Seale, 2004:295). The researcher has reconciled by conforming to the institutional setting of the qualitative and quantitative method of research. The study adopts an Interpretative Phenomenological approach for qualitative investigation and the study implements for quantitative investigation, a questionnaire survey and the Electroencephalogram (EEG) in order to prove that the devotional *sangeetham* can manifest characteristic brain changes. The research embraces both the subjective and the objective methodologies.



1.13.1 The Qualitative Methodology

The Qualitative Methodology is basically an assimilation review of theoretical literatures based on Swami Tyagaya's devotional compositions, Research books on neuropsychology, Vedic and *Sangeetham* literatures, Indian philosophy and Psychology. The specific qualitative methodology applied for the analysis, comprehension and conclusion is Interpretative Phenomenological Analysis (IPA). It has its theoretical origins in phenomenology and hermeneutics. Phenomenology is concerned with the study of experience from the perspective of the individual and it emphasizes the importance of personal perspective and interpretation. It is an approach to psychological qualitative research with an ideographic focus, which means that it aims to offer insights into how a given person, in a given context, makes sense of a given phenomenon. Usually these phenomena relate to experiences of some personal implication such as a major life event or the development of an important relationship. Hermeneutics deals with the interpretation of wisdom literature, philosophical or religious texts. Swami Tyagaya's vision of lord is a personal experience.

The researcher aims to gather through this qualitative methodology, an in-depth understanding of devotional music of Swami Tyagaya, the human behavior towards God, Brain science, Spirituality and the reasons that govern such behavior. This IPA approach emphasizes four main levels which are as follows. (i) Identification and documentation (ii) Investigation and compartmentalization (iii) Intepretation and analysis (iv) Integration and conclusion.

1.13.2 The Quantitative Methodology

The Quantitative Methodology deals with two components of investigations which is a questionnaire survey and an EEG experiment. The Questionnaire Survey is a subjective assessment of the participant's knowledge on *sangeetham*, Swami Tyagaya, brain, God and spirituality. It includes a validated tool and the survey was published by Genia, V. (1991). (*The spiritual experience index: A measure of spiritual maturity. Journal of Religion and Health, v.*30, 337-347.) It also includes the 5-point Likert-type scale. All the data collected are entered into SPSS 22 for statistical analysis and interpretation and conclusion. The Multiple composite indexes are created to assess consciousness, spiritual faith and meditation across age, race, gender, education, income denomination, family status and spiritual health status.

The Questionnaires are design and developed to estimate the psychometric values of the psychological measurements. The Inferential analysis and the Reporting Resulted with the Six Null Hypothesis statements. The Inferential analysis was conducted with the methodology of Cohen, J. (1988). The Inference hypothesis & Hypothesis testing is relatively straightforward. Certain events are pronounced in a study and the events may be due to a chance or due to some causes. Hypothesis testing explains reductionist analysis. Reductionist analysis is prevalent in all the sciences, including Inferential Statistics. It explains the difference between the Null and Alternative Hypotheses. The six statements tested are;

i. Nul HO_1 : There is no significant relationship between music and devotional experience among Indians.

ii. Nul HO_2 : There is no significant relationship between music and general perception on god, brain & devotional among Indians.

iii. Nul HO_3 : There is no significant relationship between traditional music and brain among Indians.

iv. Nul HO_4 : There is no significant relationship between devotional music and spirituality among Indians.

v. Nul HO_5 : There is no significant relationship between devotional experience and spiritual among Indians.

vi. Nul HO_6 : There is no significant relationship between general perspective on God, brain, devotional music of Swami Tyagaya and spirituality among Indians.

The alternative or experimental hypothesis reflects on the observed effect for the hypothesis. In the test, if the null hypothesis is rejected, then the alternative hypothesis is accepted. If the null hypothesis is not rejected, then the alternative hypothesis is not accepted. The survey identifies significant alternate links between *sangeetham*, Swami Tyagaya, religion, spirituality and mental health.

1.13.3 Electro Encephalogram (EEG)

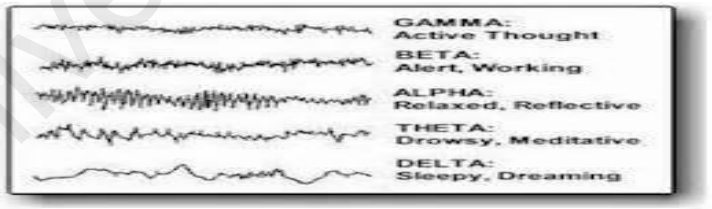
Electro Encephalogram (EEG) is an Objective assessment in Quantitative Methodology. This study explores the electroencephalographic (EEG) correlates of Divine emotions during Swami Tyagaya's *sangeetham* and devotional music listening sessions on three groups of volunteers. Principal component analysis (PCA) is used to correlate EEG features with complex music appreciation. This study applies EEG

algorithms on three groups of volunteers and each to demonstrate the feasibility of brain changes during the meditational influence of *sangeetham*. The brain electrical activity are reported as signals during the attainment of emotional changes and God realization in the brain.

This study is based on the validated work done by Sundarachari R, Dhanasree Naidu, Kokiwar PR, Surendra BV. The study is called *"Effect of Meditation on Electro Encephalographic graph (EEG), Blood Pressure, Heart Rate and Respiratory rate"* published MRIMS Journal of Health Sciences, Volule1, Issue 2, July- December 2013. The EEG procedure is also based on Dr Andrew B. Newberg *"Cerebral blood flow differences between long-term meditators and non-meditators"*. Center for Spirituality and the Mind, University of Pennsylvania.

Kasamatsmu and Hiriam; "An Electroencephalographic Study on the Zen Meditation" (1966). Journal of Psychiatry Neurology. Japan.

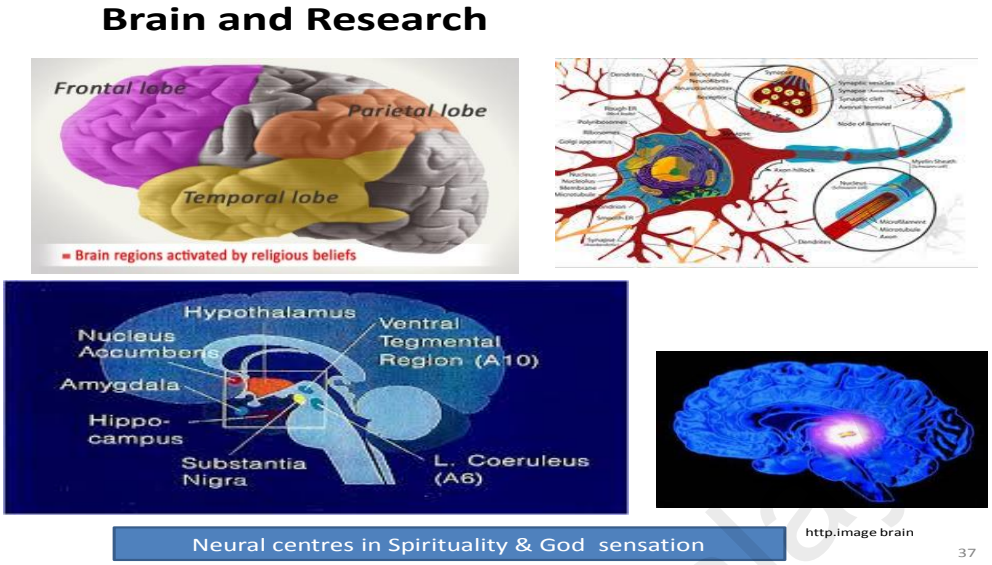
EEG. The brain is an electrochemical organ using electromagnetic energy to function. Electrical activity emanating from the brain is displayed in the form of brainwaves. They range from the high amplitude, low frequency delta to the low amplitude, high frequency beta. During Keerthana meditation brain waves alter.



The four categories of these brainwaves:
Beta Waves or beta rhythm, is the term used to designate the frequency range of human brain activity between 12 and 30 Hz (12 to 30 transitions or cycles per second). They awaking **awareness, extroversion, concentration**, **logical thinking**, **active conversation**.
Alpha Waves are electromagnetic oscillations in the frequency range of 8Ð12 Hz. They are also called Berger's wave in memory of the founder of EEG. They place the brain in states of **relaxation times, non-arousal, meditation, hypnosis**
Theta Waves is an oscillatory pattern in EEG signals recorded either from inside the brain or from electrodes glued to the scalp. They are found in **day dreaming, dreaming, creativity, meditation, paranormal phenomena, out of body experiences, ESP, shamanic journeys.**
Delta Waves are high amplitude brain waves with a frequency of oscillation between 0Ð4 hertz. Delta waves, like other brain waves, are recorded with an electroencephalogram (EEG) and are usually associated with the deepest stages of sleep and aid in characterizing the depth of sleep.

(https://www.google.com/?gws_rd=ssl#q=eeg&btnK=Google%20Search&spf=1499850525182)

(keerthana.b2010@vit.ac.in; aravind .b2010@vit .ac.in; karmal .a@vit.ac.in)



https://www.google.com/?gws_rd=ssl#q=brain+limbic+area&spf=1499851483860

1.14 Out Line of Chapters

The following chapters will elaborate on the theoretical framework of the thesis. The first chapter will illustrate the scheme of the presentation of the thesis. The second chapter will describe the background of Swami Tyagaya, his devotional life and his connection to *sangeetham*. The chapter will discuss the Theo-neuro-psychology. The third chapter will explain the methods used for the research such as the questionnaire survey and the Electroencephalogram. The fourth chapter will point out the findings. The fifth chapter will analysis the findings and discus the inferences. Chapter six will be the conclusion that will summarize the conceptual and the empirical findings.

The Chapter One points out the proposal and plan of the study; It deals with the protocol, the objective, the methodology, and the design of the study. It introduces and background of Swami Tyagaya, *sangeetham*, neuropsychology.

The Chapter Two deals with the background theoretical framework of the study. The analytical review of the Literatures on *Sangeetham* & Tyagaya's life, brain, neuropsychology and spirituality. The knowledge on *Tyagopanishad* will set the mind to reach a spiritual goal which will enhance a neurological cascade of events and a spiritual reality about God. *Sangeetham* training and experience influences neuro-plasticity in the brain. The neurons and the electrochemistry activates spiritual sentiments. Intense prayer and meditation permanently change numerous structures and functions in the brain, altering one's values and the way one perceives reality.

The Chapter Three talks about the methodology of questionnaire survey and Electro-encephalography (EEG) experiment. The methodology offers a procedure to rationalize the subjective quantitative Questionnaire Survey and scientifically rationalizes the objective quantitative Electro-encephalography (EEG) with the spiritual characteristics of Swami Tyagaya's devotional *sangeetham* in association with neuro-psycholgy. The Questionnaire Survey method will investigate on *Sangeetham*, Swami Tyagaya, brain, God and Spirituality. The quantitative method will assess the participant's spiritual experiences.

The EEG experimentation methodology explores the electroencephalographic (EEG) correlates of Divine emotions during devotional music listening or singing

of Swami Tyagaya's Carnatic *sangeetham*. The experiment will investigate on Group A, B and C about the brain activity in emotional relaxation and God realization by measuring the Alpha, Beta, Delta and Theta brain activities

The Chapter Four deals with the findings of the survey and the results of the EEG. The findings provided by questionnaire survey are in response to the rating scales. It can be seen that the findings on the Questionnaire survey data are based on the participant's spiritual practices and beliefs related to *Sangeetham*, Swami Tyagaya, Consciousness, Brain, spirituality, devotion and meditation. The findings on the EEG experiments are based on the volunteer's brain electrical activity while listening to *sangeetham* and devotional music.

The Chapter Five discusses the findings, generates conclusion and creates recommendation based on the findings of the literature evaluation, questionnaire survey and the outcome of the EEG experiments. The analyses is based on the specific statistical findings provided by questionnaire survey in response to the rating scales and the discussion is based on the neuro-physiological findings provided by EEG signals. The discussion implicates the validity of the empirical study and identifies significant links between Carnatic *sangeetham*, Swami Tyagaya, brain, God, spirituality and the welfare of the society. The inference of the discussion is based on the survey and the EEG results which will specify the goodness of devotional *sangeetham* towards mental and physical health and will how it will influence the society towards love, tolerance and compassion.

The Chapter Six recapitulates the previous chapters so that the conclusion of the study is made. The areas which are included in the recapitulation are objective, the design and the background of problem, the theoretical framework, the rationale and objective of the study, the primary research questions, the review of the survey and the EEG and the evaluation of the discussion.

1.15 The Scope and Limitation of the study

The scope of the current study is to demonstrate how Swami Tyagaya's spiritual *sangeetham* plays a prominent role in the emotional centers of the brain and proves that his devotional compositions can create a visual imagery of God. The study examines how *sangeetham* can teach us about the brain and what the brain can teach us of compassion, love, God and Spirituality. The study illustrates the benefit of spirituality to the society and how *sangeetham* activates faith, compassion, love and tolerance The scope refers to the two main parameters in which the current study is operating which is the devotional power of Swami Tyagaya's *sangeetham* and the association of neuropsychological research.

The study relies on the Questionnaire survey and the Electroencephalogram. The survey's demographic and statistical findings help to uncover and clarify the scientific and philosophical dimension of Swami Tyagaya *sangeetham*, brain and spirituality. However, the results of the statistical findings integrates with the outcome of the EEG results which clarifies the pattern and nature of devotion and identifies the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God". The analytical scientific discussion incorporates the connection of long term practicing of Swami Tyagaya's devotional

sangeetham and neuroplasticity. The study is trying to solve the divine association of *sangeetham* with spirituality. The predicament is a scientific rationalization of the spiritual characteristic of Swami Tyagaya's *sangeetham* and Neuropsychology.

No study has been attempted on Tyagaya's *sangeetham* and the brain. The neurophysiologic association of devotional *sangeetham* provides the valuable knowledge about visualizing God. The research with Electroencephalography (EEG) demonstrates the consistent outcome of the physiological and scientific properties of *sangeetham* and meditation which is discussed with the association of questionnaire survey results. The advanced statistical analysis and the EEG result provide subjective and objective evidences on the values of Tyagaya's devotional *sangeetham*. The subjective Survey findings and the objective EEG signals are significant to arrive at a favorable conclusion and prove that the study is properly substantiated.

There are a few limitations in this study but the key ones are the broadness of the problem involving devotional *sangeetham*, brain, psychology and spirituality. The limitation is that the theme of the study is personal and it has no specificity to conclude for a unanimous decision but perhaps it creates a motivation for further studies in this area. The Questionnaire survey data collection is laborious and time consuming. The structured survey makes opinions limited and hard to perceive because of the subjective nature of the opinion. The volunteers for EEG were apprehensive of the experiment at the beginning. The main restriction is in transporting candidates to the laboratory. The EEG has its limitations in the investigation process but fMRI could be ideal.

The advantage of the questionnaire survey is that it is inexpensive. The study can ask many questions over a given topic and it is an effective way to get opinions of a large number of people. The questionnaires can be completed easily and quickly. The advantages of the EEG are that it is a relatively cheap, fast and safe way to check functioning of different areas of the brain. It is a non invasive procedure that does not cause pain and it is effective in displaying the active state of the brain structures. The study is trying to reconcile this dichotomy by conforming to the institutional setting. The scope and limitation of the study encourages more work for future researches.

In conclusion the study will successfully prove that the contemplative nature of Swami Tyagaya's devotional *sangeetham* develops the experience of God in the human brain. The spiritual association can engage the society to activate compassion, love and tolerance.

1.16. Conclusion

This study formulates the procedure to unify and conduct the study on the neuropsychological association of Tyagaya's *sangeetham*. The conceptual experience of Swami Tyagaya's devotional *sangeetham* is transformed through the scientific method and the evidences are analyzed and concluded. The study attempts to understand the rationale by demonstrating that Swami Tyagaya's spiritual *sangeetham* plays a prominent role in the brain and creates the imagery of God. It also studies how modern Neuro-Physiology approves this "God-Image" in the brain?

CHAPTER TWO

REVIEW OF LITERATURE

2.1 Introduction

The purpose of this chapter is to outline the philosophy of the research in association to the many theoretical perspective such as Indian classical music (*sangeetham*), neuro-physiology, psychology and spirituality. Each of the perspective has its own underlying literature, philosophy, scientific viewpoints, biases, methodology and audience. The aim of the study is to prove a clear identity in the expressions of the philosophy of God, spiritualism, religion and science. The literature review presents various views of *sangeetham*, meditation, God, spirituality and psychology. With so many and varied disciplines discussing God, the task of defining and conceptualizing the concept of devotional *sangeetham*, neuro-science and spirituality is challenging. Each major section deals with a background summary of the main idea in the study (Gall, Borg and Gallin, 1996:21). The literature review plays a role in delimiting: a) the research problem, b) seeking new lines of inquiry, c) avoiding fruitless approaches, d) gaining methodological insights, f) identifying recommendations for further research, and g) seeking support for grounded theory (Justus J. Randolph, 2009:2).

Understanding the guideline, the researcher introduces a brief explanation of the spiritual themes of Swami Tyagaya's compositions, Carnatic *sangeetham* (music) and the scientific concepts of the brain so that it effectively contributes to the understanding of this study. The literature review explains the complexity of devotional *sangeetham*, spirituality and neuropsychology in order to strengthen the

understanding of the study. In the modern era science has contributed profoundly for the human understanding of the insight concept of God, brain and spirituality. Science and technology alone cannot lead humanity to a contented and dignified life. Humanity should place lots of reason in high moral and spiritual standards than values on objective discoveries. Humanity owes a great deal to saints for all the spiritual realization and scientists for all the material achievements. There is a natural tendency for civilizations whether religious or nonreligious to understand the concept of spirituality and God. The meaning of God and spirituality differs from one individual to the other. The devotee's faith and application strengthens his spiritual awareness about God. The awareness secures the mind and God becomes neurologically real. The spiritual feeling is transformed into a symbol in the brain which is represented in a wide range of personal, ethical, social and universal values. God could manifest as an auditory or a visual or an olfactory symbol. God is the most fascinating human experience to explore. Prominent scientists and researchers in U.S., Canada, Europe and India are endeavouring to understand the spiritual experiences and its dynamics in the brain of those who connect with the divine. They have made extensive researches with EEGs, fMRI, PET and other important investigatory tools. (BR Cahn, J Polich, 2006, www.psycnet.apa.org); (Mihai Popescu, Asuka Otsuka Andreas, 2004, A Dynamics of brain activity in motor and frontal cortical areas during music listening: a magnetoencephalographic study).

Spirituality has different implication in different situation and is different from individual to individual. Modern spirituality is centered on personal well-being, psychological advancement and moral personality such as righteousness, compassion, forgiveness, love, patience, tolerance and altruistic values (Readers Digest Dictionary,

1984:1611). Spiritual practices in the Vedantic tradition have wide range of implication in purifying the human mind and the karma (action). The goal of the *karma* is *moksha* (salvation). *Moksha* is the highest goal for attaining perfection and enlightenment. The spiritual practitioner should perform *sadhana* (penance) in various personal, religious and ritual disciplines to attain the spiritual goal. To attain a high level of spiritual success a repeated practice (*abyaasa)* and for perfect execution of spiritual action a good level of study (*kriya*) is expected. (Swami Yatiswarananda, 1998:319) Patanjali's in his book, *Yoga sutra* recommends meditation (*dyaana*) in addition to *karma yoga, bhakti yoga*, *Jnana yoga* and *Raja yoga* (Swami Yatiswarananda, 1998:319) The spiritual *sadhana* culminates in inner peace and happiness (Swami Yatiswarananda, 1998:303, 319, 397).

Sangeetham is also treated as a form of *dyaana*. Carnatic *Sangeetham* (South Indian music) has had a very special charm on the human mind because of its devotional charisma and implication. The way of life, their God, their mood, their nature and their history are predicted in the quality of their music. The *kriti*s of *Sangeetham* are like mantras. *Aum* (*OM*) is the basic mantra of all Sanskrit mantras. *Aum* is the representation of *Nada Brahmam* (primodial sound). Mantras are sets of sacred syllables for calling God or the divine symbols which were revealed to ancient *rishi*s or seers of ancient India during deep meditation. In *sangeetham* the resonance of these *suriti*s and *swara*s (micro tones and tones) attracts the mind and leads it to an inner holy experience and manifests *satvic* (puritanical) qualities. The experience in the brain can manifest as a visual or an auditory representation. The *sangeetham* represents divine feelings, emotions like pleasure, pain, love, heroism, knowledge, marriage, birth, death and Gods (Prajnananda Swami, 1973:1). *Sangeetha*

*Retn*akaram is an ancient book of Indian music and it points out that Carnatic Shastria *Sangeetham* is devotional, spiritual, philosophical and meditational. (Gopalan, ii). During the 17th century the great Bakthi movement in South India promoted the value of singing devotional *sangeetham* to attain the realisation of God. The greatest composer singer at that time was Saint Tyagaya (Gopalan, 2003:ii).

Swami Tyagaya (1767– 1847) was a great teacher of mankind. He communed with God through music and had contributed a great deal for the propagation of devotional music in South India (Sambamoorthy, 2001:11). Tyagaya comprehended the cosmic laws of divine music and through his compositions he enlightened the compassionate nature of man. He advocated that the sacredness of music is beyond logical analysis but often comprehensible through personal intuition (Sambamoorthy, 2001:85). According to Swami Tyagaya's spiritual philosophy, the mission of human life is to comprehend the *Athman* (soul), and work towards attaining "*Moksh*a" (Salvation) (Sambamoorthy, 2001:47). *Brahmam* (God) has the qualities of *Sat*, *Chit* and *Ananda* meaning Truth, Intelligence and Happiness respectively and *Brahmam* is in the nature of omnipotence, omnipresence and omniscience. (Swami Yatiswarananda, 1998:302). Among the Indians, music is believed to have a divine origin because it has its roots in the supreme sound which is known as Sabta-Brahman (Prajananda, 1973:14). Swami Tyagaya believed that his *sangeetham* had a divine origin. He convincingly believed that "God" is comprehensible through devotional intuition and contemplation.

'God' is conceived as the principal object of faith among the believers. Theologians describe Brahman (God), as omniscience, omnipotent, omnipresence,

omnibenevolence, divine, eternal and beyond imagination. God is worshipped differently by different societies. (Swami Yatiswarananda,1998:379). "God" is a mental realization and the modern science associates it with Neuro-psychology. Psychology is the science dealing with mental phenomena and its processes. It is the study of emotions, perception, intelligence, consciousness, and the relationship between these phenomena (Newberg, 2009:45). Neuropsychology studies the structure and function of the brain as they relate to specific psychological processes and behaviours. It is seen as a clinical and experimental field of psychology that aims to study, assess, understand and treat behaviours directly related to brain functioning. It is scientific in its approach, making use of brain science and shares an information processing view of the mind with theology, cognitive psychology and cognitive science (Levitin, 2006:221).

Brain-Mind dynamics revolves around the science and psychology of the brain. During the twenty-first century the relationship between science and spirituality has been influenced a great deal by neuro-psychology. The debate about the 'God spot' in the brain or the Spiritual area in the brain is actively pursued by many famous neurologists. The modern neuro-scientists are trying to learn more about how the brain functions during reported spiritual experiences. Scientists are now able to explain the special areas in the brain system that regulates visual, tactile smell, hearing systems and the consciousness state. Neuro-psychologists are providing interesting and mysterious information on the function of the brain centres and the neural circuit. The most important investigatory tools used are the EEG, fMRI, PET and others.

Newberg, a famous neuro-psychologist says," If you contemplate God long enough, something surprising happens in the brain (Newberg, 2009:4). "Devotional singing like meditation and contemplation of God for long enough can cause different neural circuits and synaptic connections in the brain to become activated and God becomes neurologically "real" (Newberg, 2009:4). The devotional experience transforms God into a symbol representing a personal, ethical and social value. This emotional experience encourages a religious and spiritual development (Newberg, 2009:5). This form of spiritual development and contemplative singing exercises could strengthen the neurological circuits involved with consciousness, empathy, compassion, love and tolerance (Newberg, 2009:17). Music listening, performance and composition engages nearly every area of the brain and the experience manipulates our emotions. (Levitin, 2006:9)

Generally, people lived in diverse situations, yet beneath the diversity there is an under-current for harmony and music emerges as an important media for unity, harmony and love. Devotional singing like prayer is incorporated in music and it is a form of meditation (Newberg, 2009:28). Meditation involves sustained concentration and deliberation which regulates brain action and breathing. Many studies have shown that it enhances relaxation and spiritual well-being (Newberg, 2009:160). Devotional singing in the form of prayer stimulates the cognitive circuits in the brain. The circuits are Prefrontal cortex, anterior cingulated, basal ganglia, temporal and the thalamus (Newberg, 2009:28). Devotional music involves emotions and emotions are powerful energy which governs a wide variety of activities involved with consciousness, empathy, compassion, suppression of anger and fear (Newberg, 2009:28). There are other scientists who have contributed, like Oliver Sack, Daniel Levitin, A. Patel,

Ramachandran and others. Their findings will be mentioned as the current study progresses in chapter five.

The advent of modern neurobiological methods over the last three decades has provided overwhelming evidence that it is the interaction of genetic factors and the experience of the individual that guides and supports brain development. Brain develops normally in the presence of DNA signaling and develop further in the stimulation of essential environmental input. The key to understanding the origins and emergence of both the brain and behavior lies in understanding how inherited and environmental factors are engaged in the dynamic and interactive processes that define and direct the development of the neurobehavioral system. The most detailed accounts of the function and architecture of these systems has come from animal studies especially the mice by Joan Stiles in her article *Neural Plasticity and Cognitive Development* (Joan Stiles UCSD, 2012). The brain cell development is called neuroplasticity. The definition of neuroplasticity is the ability for a neuron to adapt and change in response to a stimulus from its environment (Lord Watson, 1989:2). Swami Tyagaya inherited his religious qualities from his ancestors and developed his devotion for Lord Rama throughout his life.

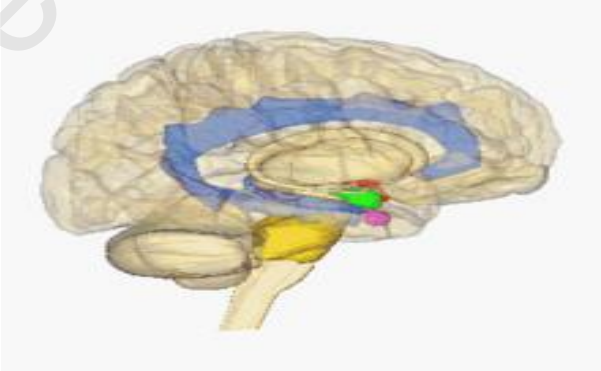
Devotional *sangeetham* is a meditative yoga and is a contemplation on God. Saint Tyagaya was a Yogi and he led a righteous and religious life. He devoted his eighty years of life singing on Lord Rama. His devotion and his steadfast focus on Lord Rama is responsible for the visual imagery of God. Modern science explains that the brain of devotional singers, when in deep focus on the 'God image' for a long period of time will bring plasticity (growth) and neocortical development. Neural

plasticity and God cognitive development are both dynamic and adaptive and it reflects on the singer's normal brain cell developmental processes. Thus, the melody of music and the devotional meditation activates a number of neurons in the respective special brain centers. Meditation opens the awareness to the infinite reservoir of energy, creativity, intelligence and spiritual emotion that lies deep within the body. Devotional *sangeetham* influences the way the brain processes the divine emotions.

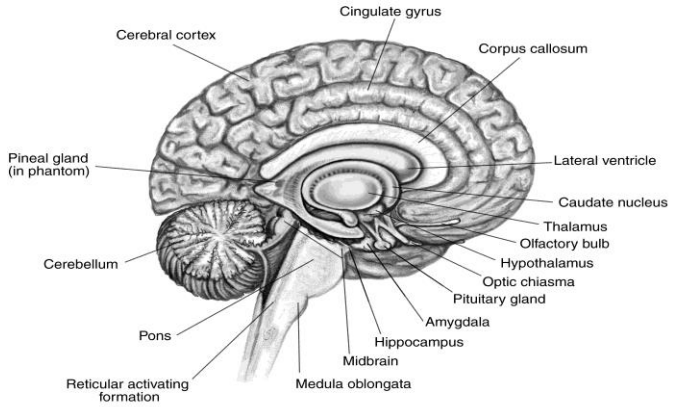
In spirituality, the basic tool needed is the ability to perceive what is referred to as an activated Sixth Sense perception which is an ability to perceive the subtle dimension of God. It also includes the ability to understand the subtle cause and effect relationship behind many events, which is beyond the understanding of the intellect. It may be called as an extra sensory perception (ESP), clairvoyance, premonition, intuition or subtle perception ability (Swami Yatishwarananda, 1998: 260). Swami Tyagaya had the ability to understand the subtle perception of God (Lord Rama). The creation of music is a product of intelligence and the devotion elevates the emotional mind from the physical level to a metaphysical state. When such an emotional state happens, the devotional singer's sense of self begins to dissolve and the singer feels unified with the devoted object of contemplation, (God). The singer achieves his goal to become closer to God. In the same way, Saint Tyagaya's envisioned Lord Rama through his deep devotional singing.

The Swami Tyagaya's *sangeetham* is spiritual in nature and is a form of meditation (V. Ragavan, 1958: 20). It is the contemplation of a higher principle which relaxes the mind against base emotions like hatred, crime and sin. The consistent practice of devotional music causes neuroplastic changes in the brain. The

brain cortical centres produce divine emotions, perception, imagination, thought and memory (Roth, 2004: 36, Becker, Shapirod, 1981). Some societies venerate music as a representation of consciousness towards divinity. Devotion to 'Divinity' is identical to devotion to "God". The emotions are represented in the brain simply by activation in specialized regions. The majority of the emotions are processed by the brain's limbic system. Divine emotions are influenced by hormones and neurotransmitters such as endorphin, serotonin, dopamines, oxytocin, cortisol and others. (Lord Watson, 1989:88). The natural blasts of oxytocin during such moments are so large and Increased Serotonin and Dopamine levels have been implicated as a mechanism in psychosis (Mark Golding, 1995). The neuro-chemical activities stimulate a creative motor-sensory system to motivate spirituality. Devotional music can transcends the limits of time and space and bring forth transcendental harmony and peace and comprehend the metaphysical aspect of God. The practise of devotional *sangeetham* can help the human society to be loving, tolerant, righteous and compassionate. Aristotle and Mozart were among those who did consider the songs of bird to be as musical as the compositions of humans (Levitin, 2006:258).



Human brain



(https://www.google.com/search?q=Human+brain+(hypothalamus%3Dred,+amygdala)

Research on God and emotion has increased significantly over the past two decades with many fields contributing including medicine, psychology, computer science and ultra-sound scanning like fMRI, PET, SPECT. The numerous theories that attempt to explain the origin, neurobiology, experience, and function of emotions have only fostered more intense research on this topic. Current areas of research in the concept of emotion include the development of fMRI, PET scans. Devotional *sangeetham* represents divinity. Music is a representation of cosmic harmony and a microcosmic representation of the macrocosm (Cook. N, 2000:75). Many sages have elevated their consciousness beyond all duality to realize the cosmic oneness through the love for devotional music. Faith in God drives the human spirit. Faith is embedded in our neurons and in our genes and it is one of the most important principles to honour our lives (Newberg, 2009:20). Devotional music increases neurologically the divine emotional perception of God. The *satvic* truth which is conveyed is that the combinations of meditational devotional singing and leading a righteous life can contribute to an atmosphere of spiritual elevation and celestial tranquillity.

It is apparent that society is slowly drifting away from one another as a result of diverse expressions. It is time to ignore the prophets of doom who daily forecast our inevitable demise. Humanity must take a quantum leap forward from this decadent development and change towards spirituality and righteous life. Devotional *sangeetham* activates a spiritual union with consciousness. Devotional music in general is love and harmony. Human beings are the most successful species the world has ever known and hence there is definite likelihood that they will accept devotional music in their lives and promote love, compassion and tolerance. Mankind need to enjoy devotional music and employ it as a loving vehicle to propagate love, devotion and peace.

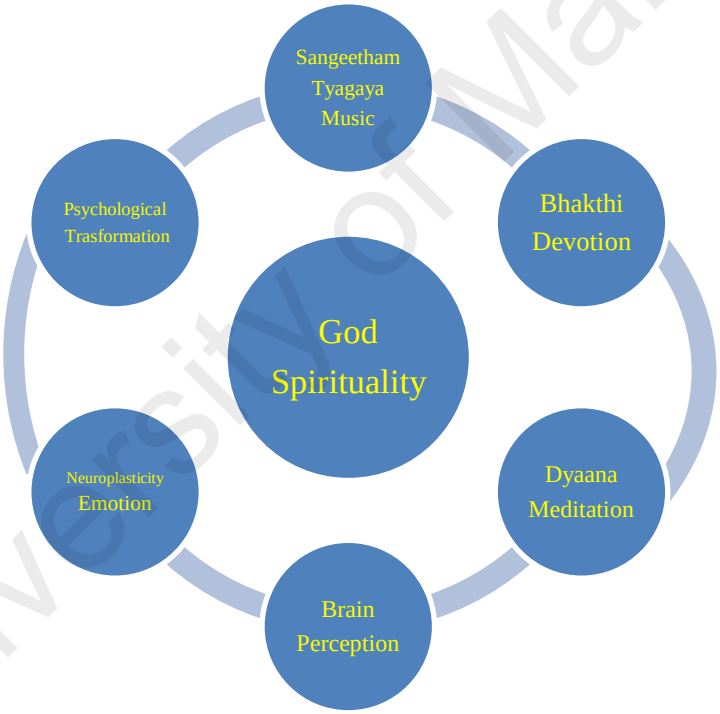
The methodology adopted in this study is both conceptual and empirical. The line of investigation is by Qualitative analysis of literature and Quantitative analysis of Laboratory experiment and questionnaire survey research. The study will demonstrating that the devotional and contemplative practices will have a substantive impact on biological processes critical for physical and spiritual health. A qualitative methodology in the form of literature review will explain spirituality, neuro-psychology, the devotional life of Swami Tyagaya and his vision of God. The quantitative methodology by questionnaire survey will demonstrate the values of a survey article review. The electro-encephalogram will investigate the different areas of the brain based on a EEG research article review (A. J, Zatorre, (1999), Alfanas, Reva, (2004).

This literature study on devotional *sangeetham*, Swami Tyagaya, God, spirituality and neuro-psychology will provide new insights into the methods of

mental and spiritual training that have potentials to enhance human health and religious tolerance. Equally important is the ability to cultivate compassion and other positive human qualities so that an ethical foundation is laid to benefit all human societies.

Holistic Model of *Sangeetham*- Brain- Spirituality.

In the forthcoming discussion of the literatures there will be frequent references to this model which is the transformation process of the physical self to the spiritual self.



2.2 Justification for literature review

The justification for writing a literature review is a means of demonstrating the researcher's knowledge about a particular field of study, including vocabulary, theories, methods, history, key variables, phenomena and experiment. Conducting a literature review also informs the important researchers and research groups in the

field. Finally, with some modification, the literature review is a "legitimate and publishable scholarly document" (LeCompte & colleagues, 2003:124). The review rationalizes that Tyagopanishad and the Shastria *Sangeetham* (Classical Music), can lead the spiritual path to realize the metaphysical discipline of "*Brahmam*", (God). Thus, devotion, meditation and singing *keerthana*s give a spiritual perception. Neuroscience plays an extraordinarily significant role in teaching about the dynamics of the brain- mind physiology in the realization of 'God'. Today, Scientists have conducted incredible researches on the brain's neural circuit and have positive results in this subject. The literatures denote that the spiritual and emotional areas of the brain are all well documented and therefore, they validate Swami Tyagaya's vision of 'God'. Thus, devotional *sangeetham* of God Consciousness associates mankind to compassion, tolerance and love. Swami Tyagaya expounds that devotional *sangeetham* which brings happiness, peace and harmony to the mind.

i. The literature study validates an EEG investigation towards an empirical research on devotional *sangeetham* and the brain.

ii. The study investigates the brain structural factor that can contribute to "God" sentiments and proves how devotional *sangeetham* activates in the brain a spiritual union.

iii. The review establishes that some famous neuro-psychologists like Newberg and V. Ramachandran have researched on the brain and God module and compared it to the present thesis.

iv. The study validates that present society needs more researches to judge the absolute value of *Sangeetham*, neoro-psychology, God and spirituality.

v. The study justifies that Swami Tyagaya's *sangeetham* and the dynamism of the mind is challenging and complex because it involves the mysteries regions of the Brain- Mind complexity. The mind is complex and multifaceted and is mostly scrutinized by subjective observation.

vi. The study concludes with the confidence that human beings are the most successful species the world has ever known and hence there is definite likelihood that they will accept and justify the use of devotional music in their lives and promote love, compassion and tolerance.

vii. The study justifies the challenge and motivates further studies in this area.

2.3. Salient literature reviews on devotional music and neuroscience

The researcher systematically reviews the different literatures with the expectation of collecting sufficient data for analysis, correlation and conclusion. On encountering an adequate literature review, examiners would proceed to look at the methods of data collection, the analysis, and the conclusions more carefully (Boote & Beile, 2005:6). Apart from the above reasons, the proof of the knowledge lies in the identification of the salient points and the scientific reasons for conducting a literature review. The relevant ideas are correlated in the form of devotional *sangeetham* and brain science. Some pertinent questions require answers from the literatures.

i. What does Swami Tyagaya's devotional *sangeetham* (music) teach of the brain?

ii. What does the brain teach of *sangeetham*?

iii. Does modern neuroscience approve this "God image" and how?

iv. How does one attain this spiritual status and what is the benefit of spirituality to the society?

Over the past three decades, developmental neurobiologists have made tremendous progress in defining basic principles of brain development and neuron-behavioral psychology. Some important published literatures are reviewed to evaluate them according to the guiding concept of the study questions. The current study is designed and developed to understand the origin and emergence of Swami Tyagaya's devotional *sangeetham* and the association to both the brain and spiritual behavior. Scientific works are reviewed to estimate the psychometric values so that it could be applied to this study. The testing provides insight into the researcher's ability to evaluate the valuable assessment of the professionals.

The researcher endeavors to understand the devotional *sangeetham* and spiritual experience of Saint Tyagaya. Therefore, the researcher has reviewed extensively many books on Indian music. An important book reviewed is authored by Swami Prajnaanda. He is a savant of wide repute and an acknowledged authority on Indian *sangeetham*. Swami Prajnaanda (1973) mentions that Indian *sangeetham* is a divine art form originated from the *Sama Ved*a and is venerated as *nada Brahamam*. This idea is important since the study endorses the divine nature of Swami Tyagaya's compositions.

Another two important books reviewed are authored by Sambamurthy on Swami Tyagaya and Swami Yatiswarananda on Vedanta. He has discussed in detail

the life and the 700 devotional compositions of Swami Tyagaya. His great work is called "Great Composers: Tyagaraja" (2001). The book says that Saint Tyagaya regarded *sangeetham* as a way to experience God's love. His objective was purely devotional while practicing devotional music and opposed to focusing on the technicalities of classical music. The statement "*sangeetham* as a way to experience God's love" is the anchor for this current study where the role of singing devotional *sangeetham* leads to spiritual transformation. The second book explains the Vedic spiritual concept of devotion and meditation by referring extensively on the book "Meditation and Spiritual Life" written by Swami Yatiswarananda (1998) narrates on human predicaments, the nature of 'Ultimate Consciousness' and the means of attaining freedom from materialism. The Swami plants the idea that the ideal of spiritual life is truly in the innermost core of life and one has to be emotionally aware of the 'God' within. He says that out of this realization comes the existence of various forms of human services. The study secures firmly that the practice of devotional *sangeetham* can manifest God in the brain which will give rise to spirituality. This knowledge substantiates the first objective of the study.

This study in addition offers a subjective quantitative Questionnaire survey to obtain valuable insights about devotional *sangeetham*, Swami Tyagaya's works, neuro-psychology and spirituality. The Questionnaire survey is based on the literature guideline of a validated tool and the survey was published by Genia, V. (1991:337-347).). Questions in the survey address the practice of prayer and spiritual beliefs. The results showed that there are group differences across the quality of life. There are also differences in life satisfaction and spiritual well-being. Spirituality is found to be associated with both quality of life and life satisfaction, although it is not a

significant predictor in a multivariate context. This questionnaire survey study assesses in the local society the practice of devotional *sangeetham*, the knowledge of God in Hinduism, the application of spirituality and the understanding of the brain dynamics with the guideline of 'Spiritual Experience Index'. The survey assists in proving the second objective of the current study.

The review on recent developments in cognitive neuroscience leads to a new way of looking at devotional music and emotion. Neurologist such as Newberg, Sack and Patel state that music occupies more areas of the brain than language does and therefore, humans are primarily a musical species. Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion (Blood, A. J. and Zatorre, R.J., 2001). Hits to the left, flops to the right: different emotion during music listening reflected in cortical lateralization patterns (Altenmueller, E., Schuermann, K., Lim, V.K. and Parlitz, D., 2002). An important literature review is made on Dr Andrew Newberg's observation of the brains of Tibetan Buddhists and Franciscan nuns as they engaged in deep prayer and meditation. He explains that the outcome is to demonstrate a God module in the brain. Andrew Newberg, is a neurologist at the Hospital of the University of Pennsylvania in Philadelphia, Many references for this study are quoted from his book, "How God Changes your Brain" authored by Andrew Newberg (2010). The study makes literature review on another outstanding scientist, Daniel J Levitin in his famous book "This is your brain on music" (2006) discusses about how music engages different regions of the brain, and many of those same regions are also important in speech, movement, and social interaction. The knowledge of the above two books has guided this study to determine the effects of devotional *sangeetham* in the brain and the

spiritual emotions it creates. These literature reviews stands as a evidence for the scientific development of Swami Tyagaya's *sangeetham* and the brain.

The study also makes literature reviews for the EEG experiment and a questionnaire survey. (dealt in chapter 4 and 5). In recent years electroencephalographic and neurophysiological studies focuses to understand the relationship between the brain mechanisms and consciousness. These studies give rise to the various electrographic findings with the psychological states and their behavioral correlates. The EEG research is based on the literature guideline of Akira Kasamatsmu and Tomio Hiriam; "An Electro-Encephalographic study on the Zen Meditation", "Psychiatry neurology Journal" (1966). The literature review reveals that a series of EEG changes was observed by practising Zen meditation and EEG by Newberg University of Pennsylvania Medical Center, USA (Newberg, 2010).

This study determines the effects of devotional *sangeetham* in the brain through an EEG investigation with the experience of Kasamatsumu's literature guideline. The EEG supports in proving the third objective of the current study. The overall analysis of literature, survey and EEG defends the fourth objective of the current study.

The researcher argues herein that there is a neat connection between the participation of devotional singing and spirituality. In spite of the small sample, the study concludes that devotional *sangeetham* strides ahead in implementing spirituality and 'God Form' in the brain. The researcher focuses on the limitations encountered in this study and points it out at the appropriate situation. He also

mentions some important recommendations. For instance, neuroscience on Swami Tyagaya's *sangeetham* is a new entity and it represents a significant branch of spiritual psychology which has to be explored further. It is apparent for further understanding of the dynamics of *sangeetham* and the brain there should be more future researches on this subject.

2.4. The Literature review and the Questions scrutinized

The American Education Research Association (2006) explains some of the ways new research can contribute to existing research. If the study is a contribution to an established line of theory and empirical research, it should make clear what the contributions are and how the study contributes to testing, elaborating, or enriching that theoretical perspective. If a study is intended to establish a new line of theory, it should make clear what that new theory is, how it relates to existing theories and evidence, why the new theory is needed, and the intended scope of its application. If the study is motivated by practical concerns, it should make clear what those concerns are, why they are important, and how this investigation can address those concerns. If the study is motivated by a lack of information about a problem or issue, the problem formation should make clear what information is lacking, why it is important, and how this investigation will address the need for information (Jason W. Osborne, 2012:45).

With the above guideline the current study examines relevant questions such as: 1. How does Tyagaya's devotional compositions construct in the mind and the dynamics of the brain centres? 2. The study justifies how Tyagaya's devotional music teaches about the realization of *Brahmam*, (God) and how science reveals

about the effects of meditational music in the brain? 3. How and why did Swami Tyagaya have religious experiences? 4. Is it purely inexplicable emotional outburst or neurological or psychological disorders? 5. Is there truly sensory centres specialized in recognizing emotional or spiritual (Godly) subjects in the brain? 6. Can these issues be proved on empirical grounds? 7. What is the status of modern Neuro-Psychology here? 8. What are the salient neurological pathways and what are the scientific experiments to corroborate music's spiritual encounters? 9. How does the musical spirit of Tyagopanishad as a spiritual practice create compassion and suppress anger and violence in the modern society? 10. Does practicing Devotional *sangeetham* activate faith, compassion, love and tolerance?

Some important published literatures on philosophy, neurology and music are reviewed to evaluate according to the guiding concept of the research objective (Literature review, Chapter One). Over the past three decades, developmental neurobiologists have made tremendous progress in defining basic principles of brain development and neuron-behavioral psychology. The study is designed and developed to understand the origin and emergence of Swami Tyagaya's devotional *sangeetham* and the association to both the brain and spiritual behavior. Scientific works are reviewed to estimate the EEG values and to assess the questionnaire survey of many candidates.

2.5. Literature design, hypothesis and application of "Interpretative Phenomenological Analysis" IPA

The literature review based on phenomenological analysis is an important design in qualitative methodology. The current study has relied largely on qualitative

and quantitative methodology for data collection. In the qualitative methodology, the current literature reviews were designed to test the hypothesis that the meditative *Sangeetham* of Tyagopanishad could produce an unique spiritual response in the brain. Two quantitative methodologies are used to a limited extent. Sufficient literatures were reviewed for the objective EEG analysis and the subjective Questionnaire survey. The line of investigation is by Qualitative analysis of literature and Quantitative analysis of laboratory and survey research.

This study is examined with three guidelines.

1. By means of theoretical assimilation of literature
2. Exploratory social questionnaire survey method and
3. Electro-Encephalogram (EEG) procedure conducted in a laboratory.

The literature examination facilitates a better understanding of Saint Tyagaya's *sangeetham,* devotional music and neuro-psychology of the brain. The study uses both qualitative and quantitative methods to collect primary data. The reason for doing so is to get an in-depth understanding of the responses from the quantitative method about the qualitative topic. The qualitative method is endorsed through literature reviews and the quantitative methods are endorsed objectively by laboratory Electro-Encephalogram investigations and Questionnaire survey methods.

The qualitative literature review investigates a random probe as well as triangulation of responses of the background of devotional *sangeetham*, Saint Tyagaya, spirituality and neuroscience. 'Random probes provide a check on the validity of questions and yield a representative sample of verbatim comments which

can be used as illustrative quotations when writing-up the research' (Gilbert, 1993:42). "They are useful and they provide illustrative material about what underlies in the justification of the study (Gilbert, 1993:42). However, qualitative analysis followed by quantitative investigation would endorse strong evidences and propose new evidences. These evidences will be useful for the current study and for future researches. Therefore the researcher opted to combine methods (qualitative and quantitative) in order to compensate for the inadequacies and benefit from the advantages of both of them.

As Philip (1998) argues, 'employing a range of methodological strategies means that the researcher does not necessarily privilege a particular way of looking at the social world. I would suggest that such diversity encompasses methodological plurality as well as postmodernism encouraging different voices to be heard and facilitating the exploration of different truths' (Seale, 2004:296). They each have distinctive characteristics that make the possibility of combining them especially attractive (Seale, 2004:296). The main subjects of the thesis are essentially Swami Tyagaya's devotional *sangeetham,* Neuropsychology and spiritualism which is a combination of Theo-philosophy and science. The complex study necessitates the combination of methods to avoid possible misinterpretation of responses and barriers. However, the methodology designed in this study is both theoretical and experimental. These guide line methods endorses to understand the relationship between devotional *sangeetham,* Swami Tyagaya, the associated dynamics in the brain and spiritual experiences. An important contribution that exploratory research can make to our understanding is helping us to identify patterns and enabling us to give names to social phenomena (Thomas, 2000:170).

2.5.1 The Qualitative approach adopts the Interpretative Phenomenological Analysis (IPA)

The Qualitative methodology applied for the analysis, comprehension and conclusion is Interpretative Phenomenological Analysis (IPA). It has its theoretical origins in phenomenology and hermeneutics. The literature referred is, Stan Lester, (1999) "An Introduction to Phenomenological Research". Phenomenological methods are particularly effective at bringing to the fore the experiences and perceptions of individuals from their own perspectives, and therefore at challenging structural or normative assumptions. Adding an interpretive dimension to phenomenological research, enabling it to be used as the basis for practical theory, allows it to inform, support or challenge policy and action. (Stan Lester, 1999:11)

A hermeneutic phenomenological research emphasizes on the metaphysical stance, methodological grounds, quality concerns and ethical issues that contribute to its paradigmatic assumptions. Finlay (2009) further states that applied to research, phenomenology is the study of phenomena: their nature and meanings. The focus is on the way things appear to us through experience or in our consciousness where the phenomenological researcher aims to provide a rich textured description of lived experience (Narayan Prasad Kafle, 2011:181)

Phenomenology is concerned with the study of experience from the perspective of the individual and it emphasizes the importance of personal perspective and interpretation. Phenomenological approaches are based in a paradigm of personal knowledge and subjectivity. Hermeneutics deals with the interpretation of wisdom literature, philosophical or religious texts. (Stan Lester, 2011:6). The goal of

phenomenological research is to arrive at the essence of the lived experience of a phenomenon. Applied as a review technique, the goal is to arrive at the essence of researchers' empirical experiences with a phenomenon. In first-hand phenomenology, the individuals who have experienced a certain phenomenon are interviewed. In using phenomenology as a review technique, the unit of analysis is the research report rather than an individual who experienced the phenomenon. When using phenomenology as a review technique, the data come from an empirical research report rather than interview data. Not surprisingly, the steps of a phenomenological review mirror the steps of phenomenological research (Stan Lester, 2011: 2).

This IPA approach emphasizes four main levels which are as follows.

1. Identification and documentation
2. Investigation and compartmentalization
3. Intepretation and analysis
4. Integration and conclusion

2.5.2 Justification of Interpretative Phenomenological Analysis

The researcher finds it appropriate to choose "Interpretative Phenomenological Analysis" (IPA) because, it is an psychological qualitative research with an ideological focus, which means that it aims to offer insights into how a given person, in a given context, makes sense of a given phenomenon. This phenomenon can be scientifically rationalized and there are sufficient evidences to prove it right.

These phenomena is relate to experiences of some personal significance, such as a major life events, or the development of an important relationship or a major experience or a emotional perception.

IPA is distinct from other approaches because of its combination of psychological, interpretative science and ideographic components. IPA is one of several approaches and appears most appropriate to qualitative phenomenological psychology. IPA enables the researcher to elicit an in-depth understanding of meanings of human practices, culture, works of art and science texts. Phenomenological analysis is based on discussions and reflections of direct sense perception and experiences of the researched phenomenon.

Conclusion of the research will be based on IPA deductive method and scientific corelation method. The understanding is produced through systematic interpretation of the scientific and survey processes.

Therefore the selection of "Interpretative Phenomenological Analysis" (IPA) will be effective and useful for this research. Literature reviews that focus on research outcomes are perhaps the most common. In fact, the Educational Resources Information Center (1982:85) defines a literature review as an "information analysis and synthesis, focusing on findings and not simply bibliographic citations, summarizing the substance of the literature and drawing conclusions from it". The Educational Resources Information Center suggests that, in terms of a developing a research rationale, an outcomes-oriented review may help identify a lack of information on a particular research outcome, thus establishing a justifiable need

for an outcome study. The current literatures review are designed to test the hypothesis that the meditative *Sangeetham* of Tyagopanishad could produce an unique emotional response in the brain and thus connect to a higher "God Consciousness" or *Brahmam* Consciousness. This research is based on Hindu Theological culture, Indian devotional *sangeetham*, Swami Tyagaya and Brain science. The researcher has adopts a multi-method approach involving

2.5.3 Literature and Philosophy

i. Literature study will be supported by the sources of Hindu Spiritual books (*Vedanta*), Indian *Sangeetham* manuscripts and literature books on Swami Tyagaya.
ii. Science study will be supported by the secondery sources of Brain text books.
iii. Psychology text books and Scientific American journals and research publications.

The knowledge extracted from book reviews are combined with documentation, discussions and observations to gain deeper insight in devotional *sangeetham*, Swami Tyagaya, neuro-psychology and spirituality. The documents are also collected from reliable libraries. Thus, through the qualitative IPA method the researcher finds it appropriate to identify, analyse, report, intepret, justify and conclude the subjective literature review. The methodology adopted in this qualitative research is conceptual and theoretical and is basically assimilation through literature review involving a wide range of reference books. They are principally:

i. Tyagaya's Musical compositions (Tyagopanishads)
ii. Books on Carnatic *Sangeetham*

iii. Books on Vedantic Philosophy

iv. Research books on Neuropsychology

v. Journals and Medical Text Books on the Brain

vi. Journals on Carnatic *Sangeetham*

vii. CDs / Internet, Utubes

viii. Devotional lectures by Swamis and Pundits.

2.5.3.1 The Theory and the Taxonomy of Literature reviews

The theory facilitates the main components of the study and the presumed relationship between them so that it provides a framework for analysis and the components are consistent. The taxonomy identifies the main subjects and their associations to the study. The theory is based on: i) Swami Tyagaya's vision of Lord Rama and the contribution of *sangeetham*. ii) The association of the *sangeetham* in the development of 'God Module' in the brain and iii. How neuropsychology views the perception.

An effective method to begin planning a research review is to consider where the proposed review fits into the thesis. Cooper (1988) in his article, "Taxonomy of Literature Reviews", suggests that literature reviews can be classified according to five characteristics: focus, goal, perspective, coverage, organization, and audience. He identifies four potential foci: research outcomes, research methods, theories, or practices or applications. Literature reviews that focus on research outcomes are perhaps the most common (Justus J. Randolph, 2009:2).

The selected significant literatures that played the pivotal role in this study can be categorized in the following categories as the theoretical framework:

i. The books on Vedanta, *Sangeetham* and Swami Tyagaya, were published in India. The works from India were written by great authorities in *sangeetham*, spirituality and Vedanta, such as P.Sambamurthy, Sri Ramanujachariar, Swami Prajnaanda and Swami Yatiswarananda.

ii. The literatures for Neurology, Psychology and the EEG were published from USA and Europe. The science literatures were written by some famous neurologists such as Dr. Andrew Newberg, Dr Oliver Wolf Sacks, Dr A Patil and Dr. Daniel Levitin.

iii. Reference articles for Questionnaire survey on God, Music, Brain and spirituality. Reference articles for EEG by Dr Kasamatsmu and validated work done by Sundarachari R, Dhanasree Naidu, Kokiwar PR, Surendra BV.

iv. The study is called "Effect of Meditation on Electro Encephalography" (EEG) (Aftanas, L.I , & Golocheikine, S.A. (2001). Human anterior and frontal midline theta and lower alpha activity reflect emotional positive state and internalized attention: High-resolution EEG investigation of meditation. Neuroscience, 310, 57-60.

v. The noteworthy books chosen for literature review on *sangeetham*, Vedanta and Swami Tyagaya are authored by renowned scholars with vast experience in

Theology, Swami Tyagaya and Indian music. Their books are published by reputed publishers in India. These publications have created academic and devotional interest throughout the world.

2.5.3.2 Literatures Review on Vedantic philosophy and Indian music

There are many literatures on Indian music and Vedantic philosophy but the significant ones are the following which are more rationalistic and the writers are authorities in their specialty and also the books are published in India. The one of the main theme of the study is Indian *sangeetham* and therefore it is apt to review the commentaries by Indian philosophers otherwise the foreign books may contain glaring biases that may be against Indian theology. The literary works of Swami Prajananda, Swami Yatiswaranda, P.Sambamurthy, Sri Ramanujchariar and T.S. Vasudevan are reviewed.

i. Swami Prajnaanda for instance carried out an evaluation study on the history of Indian classical music and the researcher has identified what issues needed to be highlighted and he has examined further the sacred nature of *sangeetham* as well as the religious philosophy that may be useful for the study. Some of the details are from his book; "The Historical Development of Indian Music" (1973). Swami Prajnaanda is a savant of wide repute and a acknowledged authority on Indian *sangeetham*. His book denotes a short survey of Indian Dance and music, Psychology and Philosophy of Indian Music. There is a systematic and valuable study of different forms and aspects of Indian Music from religious, traditional and historical perspective including discussions on aesthetic aspects of music.

The present volume traces the historical evolution of the musical materials like microtones, tones, murchhanas, ragas, scales, gitis, prabandhas, veena, venu and mridanga, dances and hand poses, rhythm and tempo as well as the philosophical concepts that are essential for the study of history of Indian music. Swami Prajnaanda denotes that kirtans sung in particular raga and thala over a prolonged period give rise to pensive feelings. The study is trying to focus that devotional *sangeetham* can function as a meditational exercise and a prayer. The *sangeetham* when sung and contemplated over a long period of time can give rise to a mystical experience. This sacred nature of *sangeetham* arises from the bhakthi tradition of India.

ii. The researcher also studied on Swami Yatiswarananda's, 'Meditation and Spiritual Life' (1998). Swami Yatiswarananda is a well known Vedantist and a respected missionary. He was well known in his life time as an illumined soul and an eminent spiritual figure. He was a most respected spiritual monk of the Swami Ramakrishna order. He has compiled valuable spiritual truths for those practicing Hinduism. The Swami explains the path of an spirituality and its association to *Karma, Bhakti, Raja* and *Jnana yoga*s. He enlightens about the importance of spiritual life and the transformation through meditational experience. These ideas have inspired the researcher to understand Divinity and spirituality in devotional *sangeetham.* The researcher has gathered important knowledge and valuable guidance in referring to these two books regarding the spiritual and meditative life of Swami Tyagaya. The researcher has focused much of his knowledge for his study from these valuable books

2.5.3.3 Review of Literatures on Swami Tyagaya and his compositions

The researcher reviews three great biographies on Swami Tyagaya and his devotional compositions. The researcher's study found a mutually supportive relationship between righteous involvement in Swami Tyagaya's life which played an active part in decisions about life and spirituality. These books have inspired the researcher to understand the spiritual life and the devotional *sangeetham* of Swami Tyagaya. The study scientifically rationalizes Swami Tyagaya's visualization of God as a focal point in the brain activity and psychology. These books have inspired the researcher to understand the Divinity in devotional *sangeetham*.

The reviewed Literature on Swami Tyagaya and his devotional compositions was written by P. Sambamuthy. He is a great musicologist who has explored extensively and researched on the life of this great poet of South India. He has written extensively on saint Tyagaya. The book is called "Great Composer: Tyagaraja" (2001). In his books 'Great Composers Book One & Two' he praises the musical literary genius of Tyagaya. The Book Two discusses the technical and rhetorical and spiritual qualities of Tyagaya's compositions. The examination of the manuscripts points interesting details and information about Tyagaya's life, parentage, disciples, *raga*s, *sahitya*s, *sangati*s and his devotion. The professor has been a pioneer and the most active promoter of Carnatic *Sangeetham* education in South India. He was the fountainhead of all South India musicology and was also well-versed in other systems of music of the world. He has much wisdom of the theory and philosophy of South Indian music. About his work on Swami Tyagaya it is quoted thus, "His span of untiring life was devoted to the subject of musicology and he pursued this study steadfastly and conscientiously, on Swami Tyagaraja" (1994). He describes Swami as

a prolific composer, a holy man and highly influential in popularizing Carnatic *sangeetham*. He says that Tyagaya composed thousands of devotional *kirtan*s in praise of Lord Rama which remain popular today. This greatness of Swami Tyagaya has attracted the imagination of the researcher.

The researcher also reviewed the book "Spiritual Heritage of Tyagaraja" authored by Sri Ramanujchariar and V. Ragavan (1958) Sri Ramanujchariar of the Madras University explains the varied qualities of Tyagaya's literary work in their book 'Spiritual Heritage of Tyagaya'. The reading will desire much knowledge on the fundamental faith in our culture and create a spiritual depth. The attainment of Love in God is achieved much easily by devotion, then other means, was the belief of Tyagaya. The researcher has gathered important information on Swami Tyagaya's about 700 compositions. The book has inspired the researcher to understand the spiritual life and the devotional *sangeetham* of Swami Tyagaya. The thesis scientifically rationalizes Swami Tyagaya's visualization of God as a focal point in the brain activity and psychology. The book has inspired the researcher to understand the Divinity in devotional *sangeetham*.

The other important literature review on Swami Tyagaya was authored by A. K. Gopalan, & T.S. Vasudevan "Sat Guru Sri Tyagaraja Kirtanaikal" (2003). Vasudevan authenticates Swami Tyagaraja's sound knowledge in theory of music and the Hindu literature. They validate him as a truly exceptional musician of the Carnatic *Sangeetham* world. They say Tyagaraja has made several valuable contributions to the field of music as a teacher, musicologist and author. They say that Tyagaraja has skillfully translated poetry for the society to practice Bakthi yoga.

Swami Tyagaya has quoted in many of his poems about his divine experience and his visual image of God. The poems are, 1. *Ella ni daya rathu*, 2. *Kannukontini, Giripai*, 3. *Inthakannu*, 4. *Nannu palimpa* (A. K. Gopalan, 2003:13). The poems are illustrated in different chapters.

The researcher has gathered important knowledge and valuable guidance in referring to the above three books regarding the spiritual and meditative life of Swami Tyagaya. The researcher describes the literary works of Tyagaya as Tyagpopanishad and fondly rememembers Tyagaraja as Swami Tyagaya. The reading experience is fascinating and highly rewarding. It is an intellectual insight. Tyagaya's musical *kirthana*s creates devotion, wisdom and intellectualism. Tyagaya preached the Upanishads through his *Keerthana*s and perhaps his work can be called Tyagopanishad (Purushothaman, 2003:41).

The researcher has summarized the salient features of the three books on Swami Tyagaya which has influenced the core fabric of the current study. During the 16th century period onwards, *Sangeetha Sastra*, (musical grammar), gradually went through radical changes. *Sangeetham* was evolved to a simpler, comprehensible media. Music became a source of festival entertainment and a method for prayer. In the monumental work, entitled "Oriental music in European Notation" Chinnasami Mudaliar has printed in staff notation many of Tyagaya's *kriti*s. (Sambamurthy, 2001:1). This book made foreign scholars understand something of the genius of this great composer. References about Tyagaya were made in the works of Fox Strangways, Popley, Miss Ethel Rosenthal and Mrs. Cousin, which has helped the

Occidentals understand the greatness of Thyagaraja as a composer (Sambamurthy, 2001:1).

India has produced from time to time great men who have revealed and restated the truths of Indian philosophy. This revealed knowledge has reminded the people of their glorious heritage. Tyagaya belongs to this noble group. He has attempted to teach the Vedic Truths in an attractive musical poetry, called Karnatic *Sangeetham*. His musical compositions are admired and popularly sung throughout the world even to this day. He is a *Sangeetha Siddhanti*, a *Vagiyakara*, a *Sahityakara*, a *Chatur Vedi*, a *Rama Bhakta* and a Swami as a *Sat Guru* (pioneer) Tyagaya setup musical standards for all times.

The flood of musical ideas that emanated from his imagination brought forth a surge of special charm in his compositions. Tyagaya has become one of the world's immortal Saints. His compositions have made Telugu a most lovable, fascinating and attractive language. His compositions have portrayed Lord Rama, as Ishwara and Paramatma. His compositions have produced a simpler form of the great Vedic truth for all people to understand and practice *Bakti*. There is a combination of tradition and individual expression in his songs. Every kind of human experience is expressed in his songs. The thought of Swami Tyagaya gives a large amount of legitimate pride to all Karnatic *Sangeetham* lovers. He was a *Lakshna Purusha* and a *Lakshya Purusha*. Therefore it is a privilege to call his compositions as Tygopanishads.

Tyagaya combined his literary talents with musical excellence and practised intense devotion to Lord Rama. He presented his body and his soul to Lord Rama. His

life was woven together with *Sangeetham*, *Ramayana*, *Upanishadam* and Spiritualism. His experiences of the divine *ananda* have found clear expression in his musical utterances. The Gopichandana Tripundra and the *akshaya* mark on his forehead reflect the true *Bhagavata* trait. His charisma tempted devotees to worship him. His poetry contained a wealth of musical knowledge and poetic ideas. He had reached lyrical heights of excellence in his musical compositions. He attained divine grace through music. Tyagaya lived a simple life and he denunciated and renunciated all forms of *boga*, (materialistic pleasures). He propagated profound *Bhakti* through his music. He was a reformer, giving spiritual training to the devotees to realize, '*Sarvam Khalvidam Brahma*" which means 'All indeed is *Brahman'* (V. Ragagvan, 1958:130). Swami Tyagaya says in his *kriti*, "*Nii bhakti bhaagya*",

> *"Only life immersed in the auspicious ocean of the devotion is life.*
> *One may be born as a religious or even as a Divine Being;*
> *His life is no life if he is not immersed in the ocean of devotion.*
> *He is only a burden on earth". (Ramanujachari, 179)*

Swami's musical literature advocates the message of *Bhakti* to attain God. He sings, "*Sangita shastrajnanamu sarupya saukhyadamee manasa*." in *Bhairavi raga*. O Mind, the gift of music and science ennobled an ocean of bliss to the full" (Ramanujachari, 1958:107). In an another *kriti* he questions, "*Sangeetha Jnanamu Bakti Vinaa sanmargamu galadee manasa*" (Tyagaya in *Danyasi raga*). Is there a higher path, O Mind than the path of devotion coupled with music (Ramanujachari, 1958:111). In another *kriti*, "*Endaromahanu bhavulu*" in *Sri raga*, he says, "Salutations to all the noble souls who have known the secrets of the *Bhagavata*, the *Ramayana*, the *Gita*, the *Veda*s, the *Sastra*s, the *Purana*s, Lord Siva, the many Gods and all those who attained long life with the endless bliss of *Bhava*, *Raaga* and *Laya*".

(Ramanujachari, 1958:28). He advises his devotees on the best way to practice Sastria *Sangeetham* and he encourages his devotees to learn music as a *Saadhana* t their spiritual effort. He advised them to consider *Sangeetha Jnana* as *Yoga* and *Siddhi*. His counsel paves the path for the comprehension and realization of '*Brahman*' (Sambamurthy, 2001:28).

Swami Tyagaya says in this *kriti* '*Swara Raga sudha rasa*' that *Naabhi, Hrith, Kanta, Rasana,* and *Naasa* are the sources of sound which originate from the *Mooladhar*a or the inner soul. The recognition of this *Mooladhara naada* is itself *moksha* or attaining God (Sri Ramanujchariar, 1958:594). Swami Tyagaya in his *kriti,* "*Emijesithenemi*" he says that, whatever one's learning, whatever one's wealth and comforts, whatever the *yaga*s one may have performed, one gains no Salvation or Grace, unless one gives up *kama, moh*a (desire and wickedness). One needs the blessing of Lord Rama (Ramanujachari, 1958:121).

Swami Tyagaya in another of his composition, "*Manasu Swadeenamaina*," he categorically states that nothing will prevail one unless the mind is in control. He says that there is no need for mantras and *tantra*s for the man who has controlled and subdued his mind. There is no need to do *thapa*s for the man who has realized that the body is not the *Athman* and there is no need for a man to worry about the future if he has taken care of the past and the present through good conduct. What is important is to realize Lord Rama (Ramanujachari, 1958:178). Aldoux Huxley classified prayer into petition, intecession, mediatation, and contemplation. Of these, petition, he said, was the lowest form of prayer; intercession the next best; mediation still higher and contemplation, the ideal. The quote closely follows Sri Thyagaraja Swami's views on

prayer. Swami Tyagaya stressed on purity of thought, unselfishness and un-attachment to fruits of worship, by quoting the *kirtana* "*Paripalaya Paripalaya*" in Reetigowlai "O: God, my pure body is your temple (Ramanujachari, 1958:176). The researcher identified the devotional issues needed to be examined and inspected many *kirthanaa*s identifying the vision of God. The researcher identified the areas for further evaluation and research. Swami Tyagaya has quoted in many of his poems about his divine experience and his visual image of God. The poems are, 1. *Bhavanutha* 2. *Samaja varakamana* 3. *Sri Rama pathama* 4. *Kamalaptha kula*.

Tyagaya emphasizes the importance of *nadopasana* with pristine purity. He educated the society to sing simple devotional songs. He taught his devotees the nature and purpose of devotional *sangeetham*, music. Through devotional *sangeetham*, he urged people to acquire the wisdom of perceiving Brahman, the intelligence to experience Him, the diligence to seek Him and the patience to wait for enlightenment. He described his Rama as an embodiment of *nada*, sound. No other composer has in such a simple and appealing ways taught music as an art, science, philosophy and ultimately, as a means to salvation. No other composer has been praised so highly by so many generations of composers and savants. From his own time to this day, composers have sung in his praise and wherever Carnatic music flourishes, there are *aradhana*s conducted as a homage to him.

Swami Tyagaya contributed immensely in redefining and simplifying religion as a spiritual science. He said, "*Sangeetha Jhanam Bhakti Veen*a". (The knowledge of good music leads to spiritual devotion). Swami Tyagaya realized a higher cosmic energy, which may be called as the Absolute Consciousness, *Nada Brahmam*. Neuro-

science explains that music communicates in the brain centres causing spiritual emotion which envisions "God". The heart of the mystery of meditational music will involve complex brain areas. Leviton quotes, "The sum total of the spiritual emotion, beliefs, desires, thoughts and feelings comes from the activities of the neurons, glial cells and atoms in the different regions of the brain" (2008:175). Tyagaya sings in his *kriti* "*Svara Ragasudha*", "To know and realise the nature of *Nada*, which is originating from the *Muulaadhaara*, primordial Sound, is itself bliss and salvation". A devoted devotee with the knowledge of *Raga*s becomes a *Mukta*, union with the Absolute consciousness" (Ramanujachari, 1958:109). The literature review qualifies the Phenomenological Analysis which has a psychological and ideological focus. The phenomena is relate to experiences of some personal significance, such as a major life events, or the development of an important relationship or a major experience or a emotional perception. This phenomenon can be scientifically rationalized with sufficient evidences. (These evidences will be discussed later in chapter 4 and 5.)

2.5.3.4 Modern Science, Tyagopanishad and Spirituality

Both science and spirituality are the search for truth. One is the search for the truth of the physical world and the other the search for the truth of the mental world called as God. As such there is no conflict between them. The current scientific paradigm does not include consciousness or mind as a fundamental reality, but seeks to explain everything in physical terms and therefore it finds no place or need for God (Peter Russell, 2003:26). On the other hand, Spirituality is often very unscientific in its approach to self-liberation. A personal experiment in nada-yoga or meditation practice will lead to the results of realizing God. In this respect spiritual growth is natural and scientific. Science and spirituality apparently belong to two different

realms which appears forever separate. Science belongs to the external world of outer phenomena and the spiritual science belongs to the internal world of perception. A closer examination however reveals that principles of physics and the principles of *Vedanta* have fundamental similarities. There are many intrinsic similarities. The knowledge of Enlightenment or knowledge of *Brahman* or God is acquired gradually through philosophy, theology, mysticism and rationalism. It is an illusory reality.

Tyagopanishad, Spirituality and Modern Science are a part of the same world. Swami Tyagaya's *sangeetham* is a *Nada-yoga* which is a meditative exercise of the brain. In this respect the spiritual growth through *sangeetham* is also considered scientific. In addition, there are studies of the brain mechanisms related to music perception, suggesting a possible dynamic role for the sensory, motor and cerebral centres in the brain evolving to a orchestrated unit to hear a melody, rhythm and beat. Humans are unparallel in their ability to make sense of sound and music. (A. Patel, 2008:3). The understanding of the neurophysiology of how the visual centre, auditory centre, motor-sensation and cerebral cortex are coupled in meditation and devotion could elevate mind perception in the development of cognizing a higher consiousness, (*Brahman*), through the action of the respective neouro-transmitters.

A closer examination however reveals that a principle of Neuro-physics explains about the Spiritual centres in the brain cortex. There are many intrinsic electo-chemical factors playing a role in the brain. From the Vedantic point of view, the knowledge of Enlightenment is *Brahmavidya* or knowledge of *Brahman*. Swami

Yatiswarananda, Ramakrishna, 1998:409). The attainment is acquired gradually through meditative yoga, musical scholasticism, spiritual philosophy, devotional theology, neurological mysticism and scientific rationalism. God appears as a visual or auditory reality to the devotee.

Tyagaya says that spiritual reality is essentially an altered level of consciousness which is compared to a quantum shift in the mind. Tyagaya, the saintly composer, expounded ways through music to train the mind for spiritual realization, *moksha*. Naturally, the brain absorbs the devotional message of the *sahithya*, and the meditative nature of *sangeetham* creates electro-chemical actions in the brain cortex. The vibratory effects of the musical notes transform the emotional centres of the brain which in turn creates the spiritual thought. Thus the mind elevates to a higher conscious plain and exhibits a sentiment of deep devotion to the concept of 'The Absolute Consciousness' called Brahman. It is anticipated that through the dedicated learning of *Sangeetham* and Tyagopanishad, a spiritual conversion is possible.

The divine knowledge transforms the brain activity to a higher pious magnitude which transmits a quantum shift from a physical level to a spiritual reality. Consequently, the mind gets spiritually elevated to a supernatural or a metaphysical height that it can directly experience the *Brahman* which is the '*Sat Cit Aananda* state', (Infinite Consciousness of Bliss). It is an extra-sensory-perception (ESR) where the mind transcends from a physical intensity to a metaphysical intensity. In this present scientific era, there are sufficient experiments to prove that music energy can communicate and bring changes in the Cerebral cortex of the brain and alter the

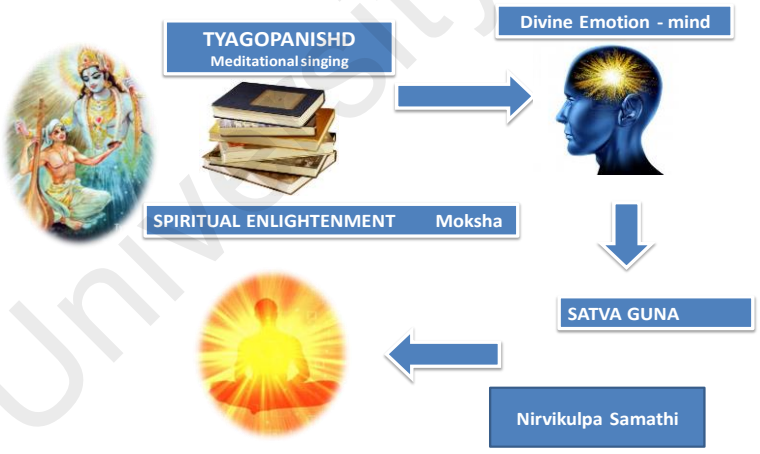
consciousness state through brain scan, tomogram and EEG (Andrew Newberg, 2010: 146). The Monk brain activity research by Dr Davidson - EEG facility in the Waisman Center at the University of Wisconsin-Madison (2008) and another research was done by Patel, & A.D., Gibson (1998). Processing EEG & syntactic relations in language and music: Journal of Cognitive Neuroscience.

The devotional, meditational and the musical feature of Tyagopanishad has the potentiality to illuminate the fundamental characteristics of the human brain function, including spirituality, memory, perception, language, vision, hearing, touch, emotion, coding, decoding and the processing of complex sequences that unfold in time. The neuroscientific study of music is a young discipline. Many researchers have revealed significant degree of positive findings in the dynamic processing of brain-mind complex by using methods that cover neuroimaging, neuropsychology, behavioral and perception studies. Incidently , the object of this research paper is to establish the dynamics that Tyagopanishads in *Sastria Sangeetham* implicates an extra-sensory perception of realising the '*Brahman*' (Absolute Consciousness) which means that through deep devotional meditation of Swami Tyagaya's compositions the devotee can elevate from a physical level to a metaphysical level. The comprehension of the devotional Consciousness happens in the brain. The mind performs an intricate and dynamic task of exhibiting thought waves like a holographic paradigm and therefore undergoes a quantum shift. It is a dynamic phenomenon of the brain and mind complex to visualize God.

This amazing research binds the mind to distinguish the spiritual energy within and without the body. It binds the body to the mind and the mind to *Brahmam*. The

Universe is *Brahma*m. The light is *Brahman*. The sound is *Brahman*. The research explains that devotional *sangeetham* inspires and illuminates the intellect to rationalize the *Brahman*. The devotional characteristics of Tyagopanishad has the potentiality to illuminate the human brain function on spirituality, memory, perception, language, vision, hearing, touch, emotion, coding, decoding and the processing of complex sequences. The quantum phenomenon of Brahman is complicated and difficult to explain. It is mystical and contains the science of probabilities. The study has gathered important knowledge and valuable guidance in reviewing various literatures regarding *sangeetham*, philosophy, neuropsychology, spirituality and meditative life of Swami Tyagaya. The next knowledge on Brain and Neuropsychology is focused from these valuable books.

Tyagaya - *Sangeetham* - Brain - *Moksha* (Spirituality)



2.5.3.5 Review of Literatures on Brain and Neuropsychology

The noteworthy books chosen for literature evaluation on brain science and neuropsychology are by expert doctors and with vast experience in brain study and

music. Their books are published by reputed publishers in USA. These research publications create academic and scientific interests.

i. The researcher's important reference book is "How God Changes Your Brain" (Andrew Newberg, 2009). This book is reviewed for the new evidences based on brain studies. The author explains about meditation and 'God module' in the brain. The author has done a wide-reaching survey of people's religious and spiritual experiences. Newberg claims that spiritual practices like prayers reduce stress and slow aging process and most important of all is the contemplating by devotion to love God reduces anxiety and depression and increases feelings of security, compassion, and love (Andrew Newberg, 2009:9). These ideas are similar to Swami Tyagaya's experience that God is great for mental, physical, and spiritual health.

   Andrew Newberg continues in his book, "How God Changes Your Brain" that those who meditate have increased activity in the frontal lobe, which is the part of the brain involved in concentration and decreased activity in the parietal lobe, which gives people a sense of orientation in time and space. Newberg is using new technologies to understand spiritual experiences. He has identified areas in the brain that indicate "emotional and spiritual feelings" for the existence of God sensation.

   Andrew B Newberg and others describe that kind of neurological process which are driven by the repetitive, rhythmic stimulation as typical of human ritual and which contribute to the delivery of transcendental feelings of

connection to a universal unity. For this to occur, they say there must be a blending of the rhythmic stimulation with ideas. Once this occurs, the ritual practice turns a meaningful idea into a visceral experience. Newberg says, "humans are compelled to act out myths by the biological operations of the brain on account of what they call the inbuilt tendency of the brain to turn thoughts into actions" (Andrew Newberg, 2010:42). Based on Newberg's works, the current study examines the following breakthrough discoveries such as intense *sangeetham*, prayer and meditation permanently change numerous structures and neurons in the brain which can alter brain function and create the perception of God.

b. The researcher has also studied the book of Oliver Sack's, "Musicophilia" (2007). It is a revelatory work of modern science which enhances physical and emotional health. Sacks is a British-American biologist, neurologist and writer. He says, "Music imprints itself on the brain deeper than any other human experience. Music evokes emotion and emotion can bring with it memory" (Sacks, 2007:66, 68). Furthermore, Sacks explains, "music brings back the feeling of life when nothing else can" (Sacks, 2007:297). Sacks state that music occupies more areas of the brain than language does and that humans are primary musical species. Recent developments in cognitive neuroscience have led to a new way of looking at music and emotion and spiritualism. "Neuroscientist Roger Penrose hypothesizes that quantum mechanics plays an essential role in the understanding of human consciousness and the philosopher Kant once called music the 'quickening art. (Oliver Sacks, 2007: 140) Oliver Sacks states that music occupies more areas of the brain

than language does, and that humans are primary musical species. (Sacks, 2007:1). Dr Sacks says, "we humans are a musical species no less than a linguistic one. All of us can perceive music, tone, timbre, pitch, melody, harmony and rhythm. We integrate all of these and construct in our minds using many different parts of the brain' (Sacks; 2007:1). The researcher of this study is encouraged by this idea because it is similar to the statement of Swami Prajnananda quoted in the literature review above. The study is based heavily on the Swami Tyagaya's devotional *Sangeetham* impact in the brain.

C. The book by Dr Daniel Levitin; "*This Is Your Brain On Music*" which is about faith and music that is as credible as it is inspiring. Livitin says, "sound is a mental image created by the brain in response to vibrating molucles.(Livitin;22). The researcher is influenced by Dr Livitin's statement and acknowledges the idea for *sangeetham* and devotion in his thesis. Dr. Daniel Levitin is a Professor of Psychology, Neuroscience and music at McGill university, Montreal and his book is "*This Is Your Brain On Music"*; Dutton/Penguin, 2006; London. Dr Levitin works on the basic nature of hearing and of music making to the neural impulses in the brain centres. He says that music is like thinking of a song that resonates deep down in the mind. It is like series of sounds are committed to a tape, and that particular combination of rhythms, timbres and pitches has lodged in the memory, making the pulse race and heart swell every time music is heard. (Levitin;2006;67). This study has adopted Levitin's material as a ideal guide and has applied the reasoning to the devotional *sangeetham* of Swami Tyagaya. Researchers are using new technologies in probing why music has

such an intense effect in the brain are using new technologies to identify spiritual experiences in the brain.

d. Dr A. Patel of Neuroscience Institute, San Dieago, starts his book "Music, Language and the Brain; Ofxord Press, 2010", by reminding the readers that the interest in music and language relationship is more than 2000 years old from the Greek scholars and has now led the cognitive scientists to rationalize how the brain deals with music and language. He suggests that both language and music represent their sound categories bilaterally in auditory cortex.(Patel,2010; 73).He discusses his results with Indian classical music with intended spiritual emotion. (Patel; 2010;314). Patel's comparative study on Indian music and language investigates how the brain plays a role in processing the sound. (Patel; 417). This study is encouraged by the research facts of Dr Patil.

e. Dr. Gottfried Schlaug a Harvard University neurologist, states that music might provide an alternative entry point to the brain. Pitch, harmony, melody, rhythm, and emotion (all components of music) engage different regions of the brain, and many of those same regions are also important in speech, movement, and social interaction. Dr Schlaug works on neuro-imaging has been inspiring and his work investigates the use of music and musical stimuli as an interventional tool for educational and therapeutic purposes and reveals the behavioral and neural correlates of singing, learning, and brain adaptation in response to changes in the environment in the developing and adult brain. Schlaug said: "Additional study is necessary to confirm causal relationships

between intense motor training for a long period of time and structural changes in motor and non-motor related brain regions. An alternative explanation may be that these musicians were born with these differences, which may draw them towards their musical gifts." There have been other findings, which suggest that the brain can be reshaped in response to repetitive tasks. "Music might provide an alternative entry point to the brain, because it can unlock so many different doors into an injured or healthy brain" (Patel, 2008:327).

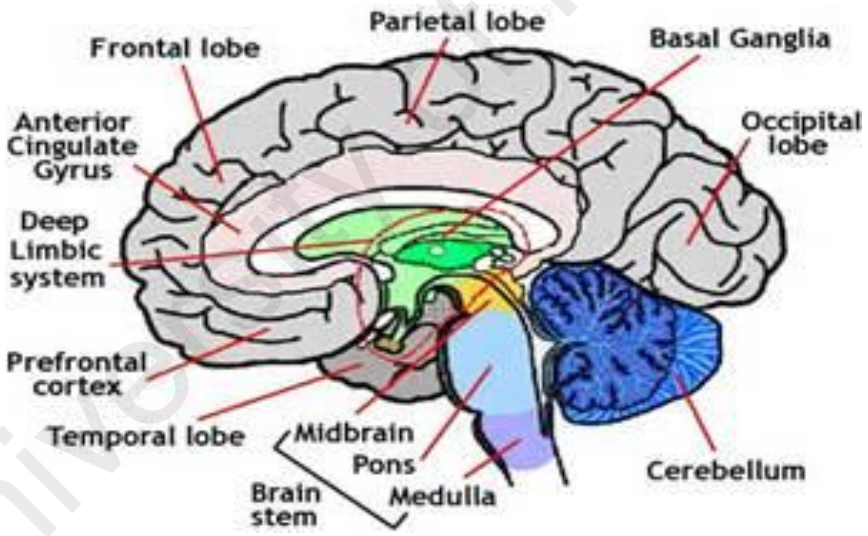
f. The researcher has constantly referred to Scientific American Mind, May 2011, Issue and series of Scientific American Journals. The researcher reviewed (i) neurobiology of music perception and music making, (ii) the use of instrumental musicians and singers as a model to examine brain plasticity, and (iii) the use of innovative musical interventions including singing and music making to facilitate recovery from brain injuries and neuro-developmental disorders. The important finding in the hidden Brain is the neurons and a class of cells called glia are behind most of the brain's work and many of its diseases (R. Douglas Fields, 2011:6). The researcher finds the books and articles are all peer-reviewed manuscripts and so are highly reliable.

These scientific books have remained as a practical guide for this research study on emotional response in the brain and its connection to special areas in the brain for the cognition of "God Consciousness". These literature evaluations have designed to test the theory that the meditative *Sangeetham* of Tyagaya could envisage the 'God' in the brain. The study has relied heavily on the scientific knowledge of Dr Andrew Newberg's, Dr Livitin's, Dr Patel's observations, findings and inferences. Researchers

are using new technologies to identify spiritual experiences in the brain circuit for more evidences.

In conclusion, the review finds the books and articles and the manuscripts as reliable information to substantiate the first objective of the study. The researcher believes that physical stimulation alone is not sufficient to generate transcendental experiences but a mental experience is essential for the spiritual enlightenment. The biological and the psychological influence should go hand in hand. The saintly life and the devotional *sangeetham* of Swami Tyagaya contribute to the spiritual enlightenment, moksha.

Human Brain



2.5.3.6 Review of Literatures on Questionnaire Survey

i. The first article mentions about the method used for analyzing the findings of the survey. Jacob Cohen's contributions to statistical analysis in the behavioral sciences reflected to help scientists answer the questions motivating human judgment. The Inferential analysis was conducted with the

methodology of Cohen, J. (1988), Statistical power analysis for the behavioural sciences (2nd Ed.). The researcher has adopted Cohen's 'The Null Hypothesis analysis' which is effectively used for the analysis of the psychological questionnaire survey. Such estimates were necessarily based on the probability of rejecting the null hypothesis with an acceptably low level of statistical significance which is the central basis for interpreting the questionnaire study findings. The following set of negations may in the formation of null and alternative hypotheses.

Nul HO_1 : There is no significant relationship between music and devotional experience among Indians.

Nul HO_2 : There is no significant relationship between music and general perception on god, brain & devotional among Indians.

Nul HO_3 : There is no significant relationship between traditional music and brain among Indians.

Nul HO_4 : There is no significant relationship between devotional music and spirituality among Indians.

Nul HO_5 : There is no significant relationship between devotional experience and spiritual among Indians.

ii. The second article reviewed was for the guidance of designing and conducting the questionnaire survey. The Questionnaire includes a validated tool and the survey was published by Genia, Vicky (1991). The spiritual experience index: A measure of spiritual maturity. *Journal of Religion and Health*, *30*, 337-347. The Spiritual Experience Index was developed to measure spiritual maturity

in persons of diverse religious and spiritual beliefs. The scale was constructed from a multidimensional conceptualization of faith and spiritual life. This guideline was useful to format the questions for the survey.

The study is all about Swami Tyagaya's spiritual experience and its relationship to brain which is a psychological proposition. The researcher adopts the methodology of V. Genia's "The spiritual Experience Index", to achieve the desired results. Many theoretical frameworks for defining and measuring the religious variables have been consulted. The thirty eight questions are on spiritual practice and belief related to God and the brain. The total eighty (80) questions of the questionnaire survey explores Swami Tyagaya's devotion, *sangeetham,* God and its consequence in the brain.

2.5.3.7 The literatures reviewed for Electro-Encephalography (EEG)

i. Dr Akira Kasamatsmu, the Neuropsychiatrist of The University of Tokyo conducted series of EEG experiments on the mental state of Zen meditation. His work is reported as "An Electroencephalographic study on the Zen meditation" (Akira Kasamatsmu. D, & Tomio Hiraim, 1966:315). This current study has adopted the above methodology as a guideline. This study has examined the EEG changes on meditation and discussed the neuro-psychological results. The subject of the present paper describes the state of the brain when the brain experiences Swami Tyagaya's *sangeetham* and devotional music. The study finds the corresponding neuropsychological state of the brain closely related to the devotional music and contemplation.

ii. The second article reviewed is based on the validated work done by Sundarachari R, Dhanasree Naidu, Kokiwar PR and Surendra BV. The study by Sundarachari is called "Effect of Meditation on Electro Encephalography (EEG), Blood Pressure, Heart Rate and Respiratory rate" published MRIMS Journal of Health Sciences, Volule1, Issue 2, July - December 2013. Dr Sundrachari is from the physiology department of Maala Reddy Medical college, Hyderabad. He and his team conducted a study on meditation and the EEG with association of the blood pressure and heart rate. The EEG aspect of their study and the mental state of meditation was associated to the present study on EEG and devotional *sangeetham*. The guidelines were helpful in discussing some of the electrographic characteristics.

iii. The researcher has frequently referred to the neurology text book called 'Principles of Neurology', Maurice Victor (2001). The main features of the reference were about the brain, the nervous system and the limbic system which supports emotion, behavior and memory. The limbic system operates by influencing the endocrine system and the autonomic nervous system. The prefrontal cortex, amygdala and the hippocampus are involved in many cognitive and emotional processes which were useful for the understanding of this thesis.

A great deal of reference was made about the EEG signals of the brain from the Neurology book. The brainwaves, Frequencies and Functions denotes that the Brainwaves may be divided into 5 categories depending on the frequency: Delta

waves (0.5-4 Hz) are dominant during coma and deep sleep. Theta waves (4-8 Hz) are associated with drives, emotions, trance states, and dream sleep. Alpha waves (8-13 Hz) reflect the brain's idle state and are found in most people in the awake condition with closed eyes. Alpha waves are the prime indicators of conscious attention, and they represent the gate between the outer and the inner world and between the conscious and the unconscious. Beta waves (13-30 Hz) indicate an aroused, mentally alert and concentrated state. Finally, the fast Gamma frequencies (30-42 Hz) correlate with will, high energy states and ecstasy. Thus, both Delta and Theta waves reflect unconscious states, whereas Alpha and Beta waves indicate awake, conscious states. Finally recent research point to Gamma waves as the brain's signature of higher states of consciousness (Maurice Victor, 2001:27-31).

This study has relayed heavily on the empirical knowledge of the above neuroscientists for their observations, findings and inferences. The researcher believes that physical stimulation alone is not sufficient to generate transcendental experiences but a mental experience in the form of meditation is essential for the spiritual realization. The researcher has pointed out that neuroscientists are using new technologies to identify spiritual experiences in the brain circuit for more evidences. This study is about learning what Swami Tyagaya's *sangeetham* and devotional music can teach about the brain and what the brain can teach about spirituality?

2.5.3.8 The Literature correlation of *Sangeetham* (music)

The researcher correlates all his literature findings on the relevant subjects for a correlated understanding of *sangeetham*, neuroscience, God and spirituality.

From the genesis of Human history, ever since mankind started on his long journey along the path of development and civilization, music has had a very special charm on the human mind. It can very well be called the magic of sound and it has always been an important element in the culture of all tribes and all races. The way of life, their God, their mood, their nature and their history are predicted in the quality of their music. Their music represented their emotions like pleasure, pain, love, hatred, heroism, knowledge, marriage, birth, death and Gods (Prajnananda Swami, 1973:1). The creation of music is a product of intelligence. Music creates emotion. Emotion generates a psychological relationship to the special brain areas. Devotional music like Carnatic *Sangeetham* is believed to be a sacred music which produces holy emotions. Intense devotional emotion can elevate the mind from the physical level to a metaphysical state. The Godly emotional state dissolves the ego centric reliance and unifies the devotional mind to the highest level of Divine contemplation. The study examines how devotional *sangeetham* can teach us about the God concept in the brain and what the brain can teach us of the dynamics of music and spirituality?

The famous neuro-scientist Dr Livitin said, "Music listening, performance and composition engages nearly every area of the brain and music is used to manipulate our emotions" (Levitin, 2006:9). Generally, people lived in diverse situations, yet beneath the diversity there was an under-current of unity and music emerged as an important media for unity, for harmony and for devotional singing. Devotional music created holy impact in the brain and therefore that holiness created a God module in the mind which replicated spirituality. Devotional singing like prayer is incorporated in music is a form of meditation (Newberg, 2009:28). Evidence point out that meditation is an excellent exercise for maintaining an healthy brain (Newberg,

2009:27). Meditation involves sustained concentration and deliberate regulation of brain action and breathing. Many studies have shown that it enhances relaxation and spiritual well- being (Newberg, 2009:160). Devotional singing in the form of prayer stimulates the cognitive circuits in the brain. The circuits are Prefrontal cortex, anterior cingulated, basal ganglia and the thalamus (Newberg, 2009:28). Devotional music involves emotions and emotions are powerful energy which governs a wide variety of activities involved with consciousness, empathy, compassion, suppression of anger and fear (Newberg, 2009:28). The objective of the literature review is to enlighten the general perception of devotional music and spiritual experiences for a better living. It shows that *sangeetham* arises from a profound intelligence and has the power to move the soul and alter consciousness. The Indians believe that *Sangeetham* is an ancient science and is the essence of *AUM*, the primal vibration which can gives rise to divine phenomena.

2.5.3.9 Literature Review on *Sangeetham* and Indian Civilization

The Readers digest dictionary defines, "Music is an art form consisting of organized tones that produce a coherent sequence of sounds intended to elicit a pleasurable response in a listener. Vocal or instrumental sounds having some degree of rhythm, melody and harmony" (Robert Ilson, 1985:1124). In sanscrit music is called as "*sangita*". The Indian treatise on music has defined sangita as a combination of vocal, instrumental and dance. The Indians are of the view that music has its roots in the 'primordial Sound' known as *Sabda Brahmam* Music that evolved in Indian soil and imbibed the spirit of the people belonging to India is known as *sangeetham*. *Sangeetham* possesses a devotional vision, a special grammar and a melodious

character of its own and it differs from music of other countries in its structure, temperament and in its method of improvisation (Swami Prajnananda, 1973:14).

Spirituality has always been the prominent content of Carnataka *sangeetham*. The beautiful blending of melody, rhythm, sacred lyrics and symphony has made *sangeetham* extraordinary and divine. The basic idea behind *sangeetham* is its divine nature. The devotional nature allows the devotee to seek the ultimate *Brahman* or God. It has been told in the Vedas that the easiest and best way to attain salvation is to sing and meditate on the greatness of the *Brahmam*. In Hindu scriptures, music and God have always been associated together. Many deities have their own musical instruments and are all portrayed as lovers of music. Lord Siva is the embodiment of *nada* (cosmic music) which is the first form of music. Lord Krishna is connected to the flute. Lord Rama is portrayed as the embodiment of the *Sama Veda*. Goddess Saraswati is always associated with the Veena as the source of wisdom.

At the beginning of the nineteenth century South Indian composers were influenced by traditional religious concepts such as temple rituals, pilgrimage and personal devotion. There were three prominent composers from the Tanjore district called Swami Tyagaya, Muthusvami Dikshitar and Syama Sastri. They advocated the *Bhakthi* tradition of *sangeetham*. They composed bhakthi kirthanas and sang them in praise of their deity. There were many composer saints who practiced the bhakthi tradition. There were the sixty three saivaite saints known as *Nayanmaar*s and twelve Vaishnavaite saints known as *Alwar*s who stand out for their extreme devotion and dedication to God (A.K. Gopalan, 2003:23).

2.5.3.10 Review on Swami Tyagaya

Saint Tyagaya Swami (1767 - 1847 AD) was the most celebrated Carnatic Music saint and was a great devotee of Lord Sri Rama. Tyagaya believed that God realization is best achieved through *nado-pasana* (music with devotion). His songs are filled with an intimate devotion to Lord Rama. All his compositions revealed his deep understanding of the doctrine of the *Veda*s, *Upanishad*s, *Purana*s especially the Ramayana. As a great devotee of Lord Rama, he insisted that music and Bhakti, should be synonymous to realize God (Sambamurthy, 2001:11). Sri Tyagaya's life is an illustration to the dictum that music and devotion combined make the best path to the understanding of the Supreme Brahman and attaining spirituality (Sambamurthy, 2001:29). Swami Tyagaya has quoted in many of his poems about his divine experience. The poems are, 1. *Ella ni daya rathu*, 2. *Kannukontini*, *Giripai*, 3. *Inthakannu*, 4. *Nannu palimpa* (A.K. Gopalan, 2003:13). The saintly musician is an example for the propagation of devotional music. He was a great teacher of mankind and he communed with God through music (Sambamoorthy, 2001:11). He comprehended the cosmic laws of divine music and through his compositions he enlightened the compassionate nature of music. He advocated that the sacredness of music is beyond logical analysis but often comprehensible through personal intuition (Sambamoorthy, 2001:85).

2.5.3.11 Review on Devotion (*Bhakti*) and God

Swami Vivekanada states that bhakti is real. It is a genuine search after the Lord. A search beginning, continuing and ending in love (Swami Vivekananda, 1963:14). 'God' is conceived as the principal object of faith among the believers. The definition of "God" is the single supreme agency postulated in some philosophical

system to explain the phenomena of the world, having a nature variously conceived in such terms as omnipotent, omniscient, immanent vital force and infinity (The Readers Digest Illustrated dictionary, London 1985:719). The Hindus call 'God' as *Brahmam*. *Bhakti-Yoga* is a pure spiritual devotion and a deep love for God. It is a method to merge with the cosmic consciousness. It is a search for divine compassion and Love. One single moment of the madness of extreme love to God brings us eternal freedom. "Bhakti is strong love to God". "When a man gets it he loves all, hates none and he becomes contented forever and this love cannot be reduced to any earthly advantage" (Swami Vivekanada, 1963:14).

Devotional music is believed to have a divine origin. Singing devotional music is a powerful way to create sacred emotions. These contemplative *sangeetham* can induce deep meditation, healing experiences, and intense imaginative journey in religious awareness. *Sangeetham* has the subtle sound combination of melody, harmony and beats. *Sangeetham* is like chanting the mantras. The saints believed that by repeating the *sangeetham* as a sacred invocation a deep meditative state is achieved and communion with God is possible. Neuro-scientists believed that meditative singing practices can bring about electrochemical and neuroplastic changes in the brain. Dr Newberg says, "Devotional singing and contemplation of God for long enough can cause different neural circuits in the brain to become activated new neurons and synaptic connections are made in the brain and God becomes neurologically real" (Newberg, 2010:1). The devotional experience transforms God into a symbol representing a personal, ethical and social value. This emotional experience encourages a religious and spiritual development (Newberg, 2009:5). This form of spiritual development and contemplative singing exercise could strengthen

neurological circuits involved with consciousness, empathy, compassion, love and tolerance (Newberg, 2010:17). The researcher believes that Swami Tyagaya should have had the visionary experience of God in his meditative state of mind.

This study attempts to show how modern Neuro-Psychology approves this "God- Image "in the brain? The devotional music is a form of meditation of a higher principle and it disciplines the mind against base emotions like felony, hatred, crime and sin and the consistent practice of devotional music causes neuroplastic changes in the brain. The brain cortical centres produce divine emotions, perception, imagination, thought and memory (Roth, 2004:36). Some societies venerate music as a representation of Consciousness. Devotion to Consciousness is devotion to God. Divine emotions stimulate a creative motor-sensory system to motivate spirituality. Devotional music can transcends the limits of time and space and bring forth transcendental harmony and peace and comprehend the metaphysical aspect of God. The practise of devotional music can help the human society to be loving, tolerant, righteous and compassionate. This study demonstrates through the EEG investigation that spiritual *sangeetham* plays a prominent role in the emotional centres of the brain and proves that devotional music of Tyagopanishad can create a mental imagery of God.

2.5.3.12 Review on Spirituality

Spirituality is explained as a process of personal transformation, either in accordance with traditional religious ideals, or oriented on subjective experience and psychological growth independently of any specific religious context (Robert Ilson, 1984:1611). In a more general sense, it may refer to almost any kind of

meaningful activity or blissful experience. Spiritualism has been the key content of Carnatic music. The basic idea behind *sangeetham* compositions is to understand 'God'. The beautiful interweaving of the devotional elements and the poetic factors have made *sangeetham* perpetual. Swami Tyagaraja said that the easiest way to attain salvation is to sing the greatness of the Almighty (C. Ramanujachari and Ragavan, 1958:30). Music and *sangeetham* in particular are the most spontaneous form of human expression. The language of a song represent the meaning which brings forth the sentiments concealed in the *sangeetham*. The bhakti saints composed their devotional poems and sang them before their favorite deities. They elucidated their spiritual urge and effectively sang their kritis for personal enlightenment. Their spiritual exercise gave rise to their spiritual goal of attaining *moksha*. Therefore, *sangeetham* or devotional music has been tested and found to be the most satisfactory tool as it attracts, enchants, enthralls and easily appeals to all segments of the society to worship God.

> *Music is the mediator between the spiritual and the sensual life." -- Ludwig van Beethoven "Music is a moral law. It gives soul to the universe, wings to the mind, flight to the imagination, and charm and gaiety to life and to everything." – Plato.* (Robert Ilson, 1984:1303)

The evaluation of the book, "The History of Indian Music" shows that *sangeetham* is one of the most powerful gateways to connect to human spiritual nature. It is believed to be from a divine source. There is no other medium other than music that can transport the mind beyond the limits of the physical body to a higher blissful and intellectual state. *Sangeetham* can help to rescue the spirits from some of the lowest points of life and it can be the blissful sound pathway for many loving memories in life (Sambamurthy, 1994:70). Tyagaya confirms that spirituality and

sangeetham can never be separated. *Sangeetham* transformed the path of his inner spiritual journey (C. Ramanuchachari, 1958:13).

The assessment of the book "Tyagaraja" shows that the comprehension of Brahman or God is an unsolved mystery of life. Indian devotional musicological treatises incorporate the theory of sacred sound as Nada-Brahman. *Sangeetham* has a profound impact in the brain. *Sangeetham* creates am meditational effect. Thus, interpreting that devotional *sangeetham* as a spiritual practice directly manifests a 'God Form" experience and therefore provides an access to the highest spiritual reality of attaining emancipation (P. Sambamurthy, 2001:2). The Vedas explains that there is a perfect union of *nada* (music) and *Paramatma* (Super power), to get *Nadopasana* (transcendental bliss). It is remarkable to note that many Westerners also believe in this theory and have contributed to its literature. Paul Brunton, a British theosophist and spiritualist, says, "Who can respond to the genius of Bach's Saint Mathew passion unless some awakening of spirituality is in him"! Johannes Brahms a famous German composer said, "When I reach my best in the task of composition, I feel a higher power working through me" (Derek Watson, 1994: 48, 125).

The examination of the literatures explains that the saints, seers and composers of classical music have basically composed songs only as a means of expressing their devout feelings and also to communicate with God. There are many illustration depicting great saints of music having spiritual union with God throughout the world. Music has the potential to inspire devotional excitement and gives rise to spiritual vision. Singing in praise of God awakens the singer's consciousness to become divine and lead a righteous life. *Sangeetham* , therefore establish a direct contact between the

Athman and the Brahman. *Sangeetham* creates a mental connection between the physical and phenomenal worlds. The glorification of God is a devotional practice initiated by saintly composers like Swami Tyagaya, *Dikshitar, Syama Sastri, Swati Tirunal, Appar, Sundarar, Manikavasagar* and many others throughout the world. The current study demonstrates the spiritual dynamics of sangeetha jnanam inorder to prove that devotional music of Tyagaya can create a imagery of God in the brain.

The literature evaluation of the book "Meditation and Spiritual Life" by Swami Yatiswarananda states that spiritualism has been the key content of Carnatic music. The beautiful interweaving of the devotional element and aesthetic factor have made *sangeetham* ethereal and eternal. The basic idea behind compositions has been to seek God. In fact, it has been said that the easiest way to attain salvation is to sing the greatness of the Almighty. This spiritual musical practice (*sadhana*) culminates in inner peace, righteousness, compassion, forgiveness, love, patience, humility, tolerance and altruistic values and happiness. Spirituality is centered on personal well-being, psychological advancement and moral personality. The *Rigveda* says *Ekam Sath Viprah Bahudha Vadanti* which translates to "The truth is One, but sages call it by different Names". Consistent with this tradition, Hindu society displays tolerance towards all other faiths. Hinduism is perhaps the only religion in the world which showed remarkable knowledge on meditation and mysticism (Swami Yatiswarananda, 1998:20, 580).

The study gathers through the various literatures that Swami Tyagaya's devotional musical compositions have a meditational consequence in the realization of

God, Lord Rama. The devotional *sangeetham* tends to reinforce serenity and spirituality in the brain. The philosophy of Swami Tyagaya is to infuse positive religious ideas to the brain centres and insure the brain to recognise a "Divine Power" called "*Brahmam* or God". The divine experience creates a spiritual emotion in the mind as "God " and in the case of Saint Tyagaya it was "Lord Rama". In the Hindu scriptures, music and God have always been depicted together. Many deities have their own musical instruments and are all portrayed as lovers of music. Lord Siva is the embodiment of *Nada* (cosmic music) which is the first form of music. The basic idea behind Indian musical philosophy is seek the ultimate *Brahman* or God. In fact, it has been told in Hindu scriptures that the easiest and best way to attain salvation is to sing the greatness of the Divine power. Spirituality has always been the prominent content of Carnatic music. The beautiful blending of the devotional element makes Tyagaya's kritis extraordinary and divine. Swami Tyagaya's vital devotional element and the vocalized glorification of God in the Carnatic tradition has contributed to a great deal to the bhakti movement of South India..

2.5.3.13 Review on the philosophy of Brain science

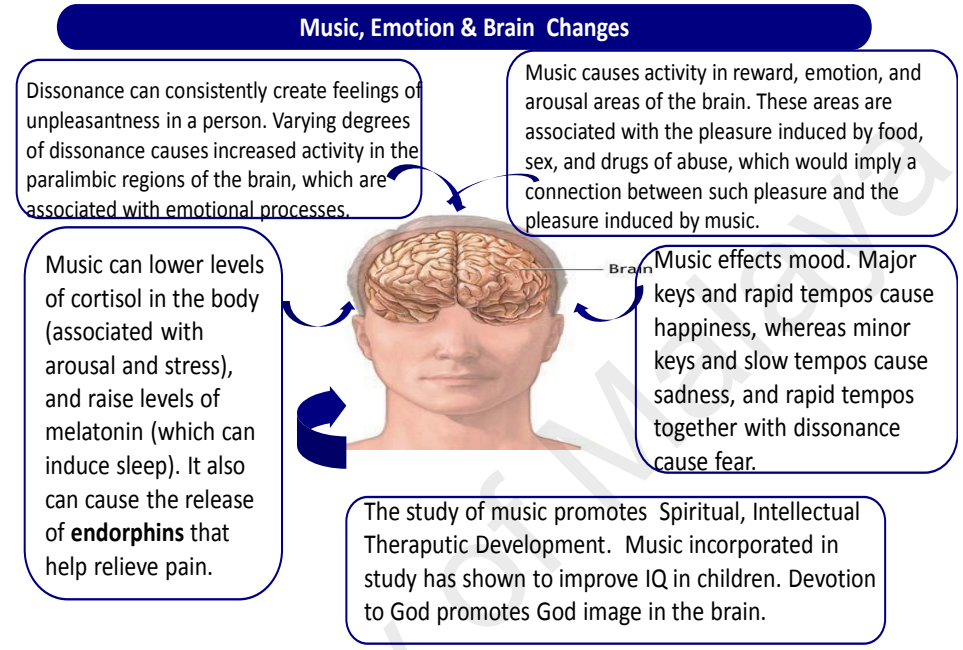
Music is a representation of cosmic harmony and a microcosmic representation of the macrocosm (Cook. N., 2000:75). Many sages have elevated their consciousness beyond all duality to realize the cosmic oneness through the love for devotional music. Faith in God drives the human spirit. The brain has the profound capacity to respond to the meditational value of devotional music. Faith is embedded in our neurons and in our genes and it is one of the most important principles to honour our lives (Newberg, 2009:20). Devotional music increases neurologically the divine emotional perception of God. The combinations of meditational devotional singing and leading a righteous

life can contribute to an atmosphere of spiritual elevation and celestial tranquillity. Aristotle and Mozart were among those who did consider the songs of bird to be as musical as the compositions of humans (Levitin, 2006:258).

Neuro-scientists have examined how the brain functions during reported spiritual experiences. Positive finding prove that certain neurotransmitters and specific areas of the brain are involved in the spiritual experience. Moreover, experiments have shown successful brain changes in individuals subjected to meditation, chanting, devotional singing, prayer and yoga. This research was done as "EEG Derived Neuronal Dynamics during Meditation: Progress and Challenges" (2015) by Chamandeep Kaur and Preeti Singh. Another article called "Brain mapping the Effects of Deeksha: A Case Study of Awakened Maneka Philipson" By Erik Hoffmann (2001). These results have led some leading scientists (Sach, Newbergh, Ramachandran) to speculate that spirituality may be induced artificially in the brain centres. The growing scientific interests in spirituality and devotional songs have garnered particular attention and have detected visible effects on the behavioral patterns of human beings.

The result of this literature study has led to suggest that spirituality protects the devotee's mental health and manifest love, compassion, righteousness and tolerance. This implies that spirituality results from devotional experiences which can produce positive emotion, higher well-being and a sociable disposition. Additionally, some studies have reported the beneficial effects of music and spirituality in the lives of patients with schizophrenia, depression and other psychological disorders. In summary the scientific associations and other psychological relationships appear

complex and inspiring. Presently, the science seems to be indicating that living in spirituality can give rise to purposeful, conscientious and compassionate life. Many doctors believe that devotional music and spiritual experience can explain the health and well-being benefits.



Splasticity- Neuro-electrochemicals-Dopamine, Serotonin produce fascinating insight into brain changes that might underlie alterations in spiritual and religious attitudes.

(*https://tackk.com/the-amazing-power-of-music*)

2.5.3.14 Literature review on Neuro-psychology

Neuro-psychologists trust that they have discovered a "God module" in the brain which could be accountable for man's natural instinct to believe in God and religion. Scientists of neurotheology say that there is a neurological and genetic basis for subjective God experiences which is traditionally categorized as religious experience. In the last ten years, neurotheology attempts to explain the neurological basis for religious experiences, such as: spiritual wonder, oneness with the universe,

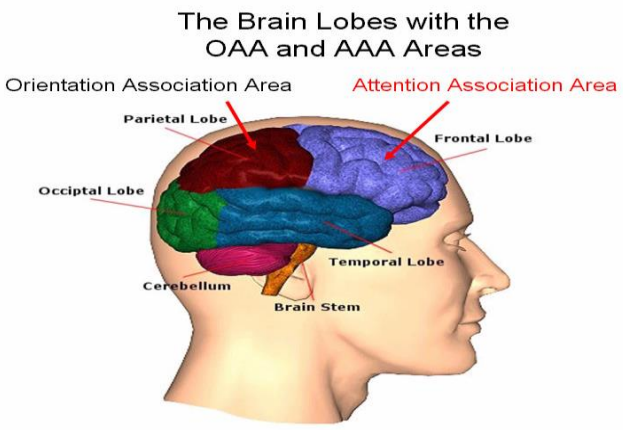
trance, enlightenment and altered state of consciousness. Brain scans fMRI and PET or EEG shows more activity in the right ventro-lateral prefrontal cortex region and temporal cortex denoting spiritual emotional experiences, whereas less activity in the amygdala, a brain region involved in emotional processing of anger and fear was calmed (Andrew Newberg, 2010:2).

The literature study shows that recent advances in brain research using the brain imaging techniques such as Single-photon emission computed tomography (SPECT), Functional magnetic resonance imaging (fMRI) and Electroencephalography (EEG) can measure and record the electrical activity of the brain. Neuroscientists have indicated through recordings that the human brain is receptive to music, meditation and devotion. It seems that the brain, over millions of years of evolution, has been prepared for the experience of unity with Cosmos or oneness with God. Andrew Newberg, professor of nuclear medicine at the University of Pennsylvania, is author of the acclaimed book "How God Changes your Mind". In an attempt to bridge science, meditation and emotion, Dr Newberg studied eight Tibetan Buddhist practitioners during meditation using SPECT scan. The images he captured showed that the brain's prefrontal cortex during deep meditation lit up in a red color indicating an increase in blood flow and neural activity in that area.

At the same time, surprisingly, the upper rear part of the brain called the parietal area turned a dark blue shade indicating a sudden drop of brain activity in that area. Newberg theorizes that when the meditator withdraws from the outside world, sensory input to the parietal brain is blocked and the neural activity in that area is shutdown (Newberg, 2010:51). At the same time due to the intense concentration on a

devotional song or mantra, the prefrontal cortex is strongly activated and will now assume the role as the brain's new experiential center. The parietal area gives the ability to orient ourselves in space and time and which gives our bodies a sense of physical limits and the self a sense of separateness from the rest of the universe. When the parietal brain is deactivated the physical limits of the body and the sense of separateness disappears. The brain can no longer create a boundary between self and the outside world, or locate itself in physical reality.

As a result, Newberg says, the brain has no choice but to perceive that self as endless, interwoven with everyone and everything. (Newberg, 2010:52). This is the state Newberg calls 'Absolute Unitary Being'. The Vedanist prefer to call it the *Oneness State* or God state or Mukthi. Newberg's research suggests that the fundamental change in brain function with a shift in brain dominance from the parietal to the prefrontal area. Therefore, when the over-activity in the parietal brain is decreased and the under-activity in the temporal brain is increased, there is a shift of the brain's command center and the individual wakes up to a higher level of consciousness and to a new reality. Swami Tyagaya experienced this higher level perception. His poems claim that Swami Tyagaya visualized Lord Rama and attained enlightenment. This mental perception is primarily due to devotional transformation of the musical impulse. The transformation is biological and experiential with environmental association.



Singing in the Brain.. https://tackk.com/the-amazing-power-of-music

(Andrew Newberg, 2010:50)

Some of Newberg's findings have been corroborated by neuroscientist Richard Davidson, University of Wisconsin. Davidson collaborated with Tibet's Dalai Lama who sent eight of his most accomplished meditators to Davidson's laboratory for a scientific study. Using both EEG and fMRI scans, Davidson studied the monks during deep meditation and found very high activity in the prefrontal cortex - especially on the left side which has to do with feelings of joy, happiness and compassion. The EEG recordings did not show detailed descriptions of the monks' levels of spiritual development in the above studies we have no idea whether any of them were in a

permanent awakened state (Newberg, 2010: 62, 178). EEG has been helpful in understanding musical behavior because music is time based and EEG has the best resolution in the temporal cortex (Livitin, 2006:124). The relaxed brain waves during meditation, chanting and devotional *sangeetham* show Delta, Theta and Alpha signals in EEG graphs.

Individuals with number of years of more experience in meditation have shown more Alpha activity than those with no experience in meditation. Many empirical observations of alpha waves point out its being not of action but of hypofunction of the brain and in attempting to relate the various stages of the EEG pattern to corresponding psychological states and the behavioral correlates. (Sundarachari, R, 2013). Dr. Lindsley states that during more or less continuous relaxed state of wakefulness, amplitude modulated alpha waves are characteristic. The same concept is stated by Dr. Jasper in his sleep-wakefulness continuum. He introduces the concept of the cortical excitatory states reflected on these EEG patterns. According to Jasper's suggestion, it is said that the amplitude modulated alpha waves reflect the lowered level of the cortical excitatory states (Lindsley, 2010).

2.5.3.15 Literature review on Society and Spirituality

Spirituality in Hindu philosophy is an individual experience. Hindus believe spiritual practice as one's journey towards moksha which is the awareness of the Brahman and the true realization of the superior cosmic truth. Hinduism identifies four ways of spiritual practice to realize the moksha. The first way is through Jnana yoga, the way of knowledge. The second way is through *Bhakti yoga*, the way of devotion. The third way is through Karma yoga, the way of action. The fourth way is

through Raja yoga, the way of contemplation and meditation. In the modern civilization, spirituality and religion appears disconnected and spirituality has become more oriented on subjective experience. The new development in the society is the growth of secularism and decline in traditional religions. These new wave has given rise to free expressions and a self professed view of religion.

The world communities are slowly drifting away from one another as a result of diverse positions. Humanity must take a quantum leap forward from this decadent development and change towards consolidation, dialogue, tolerance and righteous life. *Sangeetham* can play a unique role of uniting people because music is admired by all living creatures. Human beings are the most successful species the world has ever known and hence there is definite likelihood they will accept devotional music in their lives and promote love, compassion and tolerance. Devotional music activates a spiritual union with consciousness. Devotional music gives rise to love and harmony. Mankind need to enjoy devotional music or *sangeetham* and employ it as a vehicle to propagate love and peace.

The current study shows a method towards an empirical research on devotional *sangeetham* and the brain through EEG. The research conveys which brain structural factor can contribute to divine "God" emotional expression. The research also assesses how the present society judge about *Sangeetham*, neoro-psychology, God and spirituality through a questionnaire survey. The inference of the study establishes that the present society is favorable to spirituality, God and Devotional *sangeetham*. This unique research has attempted to explain Saint Tyagaya's vision of God and the association of the brain. The direction of *sangeetham has a* meditational effect in the

brain and creates an emotional atmosphere in the fulfillment of the realization of God. The study illustrates how the brain attains this spiritual status. The end result of the study endorses the first and the fourth objectives. (Swami Tyagaya's vision of Lord Rama and that practicing devotional *sangeetham* will activate faith, compassion, love and tolerance in the society).

2.6 Conclusion

The review of the various literatures on *sangeetham*, Swami Tyagaya, Vedantic philosophy, neuropsychology formulates the theoretical background and methodological framework of this study. The literature findings unify the conceptual reality of devotional *sangeetham* to the scientific reality of the brain. It adequately justifies the research method and contributes to the development of the research arguments. The literature evidences relates to the aim and objective of the study. The literature analysis substantiates Swami Tyagaya's experience of God through devotional *sangeetham*. The application of "Interpretative Phenomenological Analysis" validates the first and the fourth objective of the study.

CHAPTER THREE

THEORY AND METHODOLOGY

3.1 INTRODUCTION

The chapter three deals with the methodology of questionnaire survey and Electro-encephalography (EEG) experiment. The methodology offers a procedure to rationalizes the subjective quantitative survey and it rationalizes scientifically the objective quantitative Electro-encephalography (EEG) with the spiritual characteristics of Swami Tyagaya's devotional *Sangeetham* in association with neuro-psycholgy.

The study has made extensive preparation for the Questionnaire survey and Electro-encephalograms (EEG). This chapter offers a descriptive and explicable methodology to perform the survey and the (EEG) investigation. The methodology for both the procedures deals with nine basic responsibilities.

1. It deals with the thorough description about the EEG experiment and the Questionnaire survey.
2. It deals with the procedure, criteria, safety and the outcome of the experiment.
3. It deals with the needs to review the questions and the variables.
4. It deals with collecting the necessary data.
5. It deals with reasonable assurance that the findings are accurate and credible.
6. It deals with the justification for selecting the various methods for data collection and the problems to face.

7. It deals with the accuracy of studies of other research articles and review literature.
8. It deals with the detailed description of steps taken to collect the survey data and the EEG data.
9. It deals with tools used for the statistical analysis and inferences for both the survey and the EEG.

The methodology shows the development of a questionnaire survey with a grand total of Eighty two questions to measure five different types of subjects extending from Swami Tyagaya, *Sangeetham*, devotional music, neuro-psychology and spirituality. The compilation of questionnaire is distributed to the Indian community in Malaysia. The intention is to assess the Psychological measurement with Psychometric properties of Tyagaya's *Sangeetham* and spirituality which addresses the society's abilities, attitudes, traits, knowledge and educational progress. One part of the field is concerned with the subjective measurement of knowledge, abilities, attitudes, personality, wisdom, and education with the validation of assessment instruments such as questionnaires and personality tests. The other part of the field is concerned with statistical measurement theory like item response theory, correlation theory and hypothetical nullifying theory. The Statistical Package for the Social Sciences, (SPSS 22), is used for statistical analysis. In this methodology, significant effects are demonstrated in both descriptive statistics and anova results based on gender, age, academic specialty, economic status, musical skills, and research productivity. The survey methodology approach is robust and replicable and is beneficial for this study. This method is realistic and the individual data is an

exemplar for other alternate level of studies. This rich array of survey model can integrate more realism into many other macro-level models.

The methodology illustrates the development of an EEG experiment with a background assessment questions. The formulated EEG experiments are conducted on three groups of Indian volunteers with and without *Sangeetham* knowledge. The intention is to assess the scientific dimension of the electrical signals from the brain of selected volunteers who are exposed to Swami Tyagaya's devotional *Sangeetham* against two control groups of volunteers who are not. The purpose of the EEG is to determine the effects of Swami Tyagaya's *Sangeetham* in the brain and to study the influence of devotional songs in the brain and correlate the electrical signals. The results are compared with the EEG results of the control groups. The correlation is to measure the effect of Swami Tyagaya's *Sangeetham*, devotional music, in the brain for spirituality and neuro-psychological results. The study will investigate the origin and emergence of both the structure and behavior of the brain towards Swami Tyagaya's *Sangeetham*. The study will understand how inherited and environmental factors play important interactive processes in the development of the brain system towards visualizing God. The study will recognize the spiritual experience and its dynamics with Swami Tyagaya's devotional *Sangeetham*. The outcome is to demonstrate a God module in the brain.

Both the quantitative methodologies show the key to understand the psychological characteristics of the local Indian society and the neurological aspects of the brain in the influence of devotional meditative *Sangeetham*. The purpose is to go to the grass roots of the society to obtain valuable insights about *Sangeetham*,

Swami Tyagaya, devotion, brain, and spirituality. The study formulates a close link between long term devotional *Sangeetham* singing, the brain changes and spirituality. It may be suggested that Swami Tyagaya's *Sangeetham* and devotional singing can bring about a sacred spiritual dynamics in the brain.

3.2 THE RESEARCH DESIGN

The design of the current study offers a methodology that can enable better understanding of Swami Tyagaya's devotional *Sangeetham* and neuro-psychological properties. The study uses both qualitative and quantitative methods to collect primary data. The reason for doing so is to get in-depth understanding of the responses of *Sangeetham* and the brain. The qualitative analysis is endorsed through the review of the various literatures on *Sangeetham*, Swami Tyagaya, Vedanta and neuro-psychology. The quantitative empirical methodology is formulated by a laboratory Electro-encephalogram investigation on selected candidates. The quantitative subjective methodology is devised by the Questionnaire survey method. The survey investigates the responses of the society on *Sangeetham*, Swami Tyagaya, brain and spirituality as a random probe. "Random probes provide a check on the validity of questions and yield a representative sample of accurate comments which can be used as illustrative quotations when writing-up the research" (Gilbert, 1993:42).

The qualitative analysis of literature and the quantitative analysis can acquire detailed explanations of responses that emerged from the the questionnaire survey and the EEG. Therefore the researcher, prefers to combine both methods (qualitative and quantitative) in order to compensate for the inadequacies and benefits from the investigations. As Philip (1998) argues, 'employing a range of methodological

strategies means that the researcher does not necessarily privilege a particular way of looking at the social world. I would suggest that such diversity encompasses methodological plurality as well as postmodernism encouraging different voices to be heard and facilitating the exploration of different truths' (Seale, 2004:296). According to Bryman they each have distinctive characteristics that make the possibility of combining them especially attractive (1992;231). The study provides illustrative material about what underlies the respondent's views of *Sangeetham*, Swami Tyagaya, Brain and spirituality. Additionally, the main intention of the study is essentially in substantiating Swami Tyagaya's devotional *Sangeetham* brings neuro-spiritual changes in the brain. The study is in fact a combination of Theo-philosophy and Neuropsychology. The complex study necessitates the combination of various methodologies to avoid possible misinterpretation of responses and barriers.

3.3 DATA COLLECTION

The questionnaires are in English language. The questionnaires are distributed by email and as well as hand delivery depending on which method is convenient for the respondents. In either case, the researcher explained the purpose and use of the study and sought their consent in a letter. A four pages structured self-completion questionnaires with open ended questions were sent electronically and by hand to the general public of Indian society of Malaysia and University students of Malaysia. (Indian society is important because they may be familiar with the context of the questionnaire like *Sangeetham*, Swami Tyagaya and Vedanta). The primary data are collected using the questionnaire guidance. This is to allow for triangulation of results. The Secondary data of previous researches as well as

theoretical articles and other discourses relating to the subject are also used to gain in-depth knowledge and therefore understanding of the subject and its previous findings.

3.4 DATA ANALYSIS

Lofland and Lofland, Glaser and Strauss, argue for the importance of combining data collection and analysis as much as possible (Thomas, 2000:113). This approach has worked well mainly due to the combination of data collection methods. The answered questionnaires were received slowly in full numbers which gave sufficient time for checking them thoroughly. However, it was impossible to do full data analysis at this stage. According to de Vaus (2002:203), there are four broad factors that influence data analysis. They are: 1. The number of variables being examined 2. The level of measurement of variables. 3. Whether to use the data for descriptive or inferential purposes and 4. The ethical responsibilities. Subsequently, the study included these four above factors and incorporated the Six Null Hypothesis statements of Inferential Tests.

The questionnaire had both open-ended questions. However, additional and different responses came up during the survey which necessitated implicit coding. Data from self-completion questionnaires were analyzed by using SPSS 22 method. This was in order to generate frequencies of responses as well as relationships between them. Two methods of analyzing meaning were used thus; meaning condensation which is an abridgement of the meanings expressed by the respondents into shorter formulations and narrative restructuring for the temporal and social organisation of a text to bring out its meaning. (Kvale, 1996:192).

3.5 VALIDITY, PRE-TEST STUDY RELIABILITY AND GENERALITY

Validity is the truthfulness or correctness of the measurement as planned or intended. Seale gives seven threats to (internal) validity thus: history, maturation, instability and regression, testing, instrumentation, selection and experimental mortality (Seale, 2004:74). Bearing the importance of validity, the study was designed and conducted from 1st December to 31st March (Four months), which was adequate for the respondents to answer the questions diligently..

The questionnaire was pre-tested to both professionals (specialists in the field, supervisors etc) as well as some respondents. This was to guard against the threat of instrumentation as well as testing. Experimental mortality would have little effect since the study was not 'experimental' but a survey. Reliability concerns the consistency with which research procedures deliver their results (Seale 2004:72). It also relates to the repeatability of the findings under similar conditions. Apart from statistical variations, it is doubtful whether a similar study would yield very different findings. Additionally, the same questions were asked to all respondents and the questionnaire can be used elsewhere, hence the study is repeatable. The research has also applied Pearson correlation method to determine generality of findings. It would be inaccurate to claim hundred percent reliability and validity due to the limitations of understanding and knowledge of the subjects

3.6 ETHICAL CONSIDERATIONS AND LETTER OF CONSENT

According to Finnis (1983), ethics is a branch of philosophy, said to have been initiated by Aristotle, which takes human action as its subject matter (Seale, 2004:116). A central issue in ethics, Ali and Kelly argue, is the relationship between

the individual and the social world (Seale, 2004: 117). They further argue that, in research, we need to consider how the imposition of the research on individuals (with their consent or otherwise) can be balanced with the benefit of making the world a better place to live in. Indeed a number of ethical considerations were taken into account throughout this study. Therefore, a letter of consent was printed on the Questionnaire form and also sent through email to the respondents. The consent for EEG was also acquired. However, before the EEG procedure, the purpose of the study and the research subject was explained to the volunteers. They were as well as assured of their confidentiality and while at the same time their consent was solicited. The EEG brain experiment was completed after their confirmation of willingness to participate in writing. Therefore, the researcher has tried as much as possible to respect the volunteer's privacy.

3.7 LIMITATIONS AND ADVANTAGE OF THE STUDY OF QUESTIONNAIRE AND EEG

There were some limitations in Questionnaire survey and the EEG experiment. The key limitation remained in the complexity of the topics such as Swami Tyagaya, devotional *Sangeetham*, brain, neuro-psychology and spirituality which are philosophic, cultural and scientific subjects. The questions are numerous and voluminous for simple comprehension and the topics are not specific to one type of decision making. The complex nature of the questionnaire appeared little confusing for some respondents which was unavoidable. The specific background particulars and the questionnaire form had to be distributed to all candidates and the reply collected in the specific period of time which was difficult. Some volunteers were less conversant with the English language. Some candidates were ignorant of Swami

Tyagaya and *Sangeetham*. The characteristic advantage was that the volunteers were willing to answer the questions. Some vague questions were purposely placed for intelligent answers. Structured surveys normally use closed ended questions which makes opinions clear.

Bryman (2001) has argued that research methods are rooted in epistemological and ontological commitments…. The epistemological positions in which the two methods (quantitative and qualitative) are grounded constitute irreconcilable views about how social reality should be studied (Seale, 2004:294). Philip (1998) echoes this distinction and notes, 'recognizing this destabilizes the distinction between the two approaches and therefore their apparent incompatibility' (Seale, 2004;295). The study tries to reconcile this dichotomy by conforming to the institutional setting in which the research was carried out. The study investigates the complex subject of Swami Tyagaya's *Sangeetham* and the brain factor which cannot be a pure qualitative research through review of literature books. The nature of the topic in the form of brain dynamics deemed necessary to resort to quantitative investigatory method such as EEG experimentation. The limitation of the EEG instrumentation is that the volunteers were initial anxious about the procedures. The influence of the EEG is not absolute but it has certain limitation in the activity of the brain.

The advantages of the EEG experiments are that it is a relatively cheap, fast, and simple. It is a safe way to check functioning of different areas of the brain. It is a non invasive procedure that does not cause pain and it is effective in displaying the electrical activity of the brain. The advantage of the questionnaire survey is that it can

be inexpensive especially if they are self administrated and they can be sent to different locations by using mail, email or by hand. The questionnaire needs no guidance and they can be completed easily and quickly. It is an effective way to get opinions of a large number of people.

3.8 SIGNIFICANCE OF THE SURVEY AND THE EEG STUDIES

The questionnaire survey is significant from a subjective point of view. The survey is cheap and can be distributed widely. They do not require much effort. The answers are simple to compile. The questions are vivid and the respondents can read the questions and reply to them. Some time for some researchers the demographic survey by questionnaire may not be concrete. Some statisticians say a result is "highly significant" which may mean that it is "probably true". They do not essentially mean that it is highly significant. Generally Statistical surveys are undertaken with a view towards making statistical inferences about the population being studied. The response depends strongly on the survey questions. Surveys provide important information for all kinds of public information and assist in research fields. The field of survey in this study is on *Sangeetham*, Swami Tyagaya, brain and spirituality.

The EEG experiments are true and important from an objective methodology point of view and it remains scientific for the study. The Electroencephalography is a non-invasive method to record electrical activity of the brain along the scalp. EEG measures voltage fluctuations resulting from ionic current flows within the neurons of the cortex of the brain. In this research, EEG is used for the recording of the brain's electrical activity over a period of time when exposed to devotional Carnatic *Sangeetham* and other devotional music. The multiple electrodes placed

on the surface of the scalp produce the different electrical activities which are recorded as a graphic form. Along with fMRI and CT scans, EEG continues to be a valuable tool for research. The EEG experimentation used in this research establishes the physiological activities of the brain under the influence of devotional meditational *Sangeetham*.

Therefore, the purpose of the questionnaire survey study is expected to indicate the aspiration of the society towards Devotional *Sangeetham,* Swami Tyagaya, brain and spirituality. The purpose of the Electro-encephalogram will show the evidence of the electrical activities in the brain in the influence of Swami Tyagaya's devotional *Sangeetham*. The study attempts to show evidences for the following points subjectively and scientifically.

1. Swami Tyagaya's visualization of God Rama can be real.
2. Spiritual life and God realization signifies tolerance, righteousness, compassion, humility, and love.
3. Spirituality is one's journey towards *moksha*, awareness of self, the discovery of higher truths, true nature of reality, and consciousness.
4. Devotional *Sangeetham* can enhance specific neural activity for God sensation.
5. There are spiritual perception centres in the neocortex where the neurons can comprehend God, (God module).
6. Modern neuroscience explains through brain imaging methods, the neuroplasticity in the emotional centres and increase neuro-vescular activities in the multiple brain parts. The EEG elucidates electrical activities in the brain.
7. The brain can create a visual imagery of God.

8. Swami Tyagaya's *Sangeetham* leads to spirituality and the perception of God is possible in selected mind.

Therefore the significance of the study is that devotional *Sangeetham* as a contemplative practices may have a substantive impact on the biological processes which may be critical for the wellness of the physical and spiritual health. Research on meditation and theo-psychology may provide new insights into the methods of mental and spiritual training that have potentials to enhance human health, compassion and love.

3.9. THEORY AND METHODOLOGY

The theory is based on 1. Swami Tyagaya's vision of Lord Rama and the contribution of *Sangeetham*. 2. The association of the devotional *Sangeetham* in the development of 'God Module' in the brain and 3. How neuropsychology views the perception.

The technique employed are both qualitative and quantitative research methods for data collection on subjective and empirical investigations respectively. Thus, through the qualitative and quantitative methods the researcher finds it appropriate to identify, analysis, justify, intepret and conclude the subject and the object of the study.

The methodology adopted in this current study is both conceptual and scientific. The line of investigation is by Qualitative analysis of literature and Quantitative

analysis of Laboratory and Survey examination. This study is researched with three guidelines.

1. By means of theoretical assimilation of literature
2. Exploratory social Questionnaire survey method and
3. Electro-Encephalogram (EEG) procedure conducted in a Laboratory.

These three guide line methods endorse to understand the relationship between devotional *Sangeetham* of Swami Tyagaya and the psychological aspect of the brain. The guide line also supports the society and spiritual experiences. An important contribution that exploratory research can make to our understanding is helping us to identify patterns and enabling us to give names to social phenomena (Thomas, 2000:170).

The research tools employed were:

i. As a Subjective analysis a Questionnaire survey on Devotional *Sangeetham*, Swami Tyagaya, God, brain and spirituality.
ii. As an Objective analysis, the EEG laboratory investigation is con ducted on the brain to assess the electrical signals emitted in the cortical area of the brain as a result of the effects of Swami Tyagaya's devotional singing and its spiritual philosophy. This EEG study is demonstrating that the contemplative practices may have a substantive impact on biological processes which is critical for physical and spiritual health. The EEG research on devotional songs, meditation and Theo-psychology provides new insights into the methods of mental and

spiritual training that has potentials to enhance human health and religious tolerance.

3.9.1 Qualitative Methodology

In the qualitative method the reiview of the literature is based on Hindu Theological culture, Indian devotional *Sangeetham*, Brain science, psychology and Spiritual science. Therefore, this study will be supported by the primary sources of Hindu Vedanta books, Indian *Sangeetham* manuscripts, Neuro-psychoplogy text books and Indian classical literature books on Swami Tyagaya.

The Qualitative methodology adopted in this research is conceptual and theoretical. The study is basically an assimilation literature review involving;

- Tyagaya's Musical compositions (C. Ramanuchari)
- Books on Carnatic *Sangeetham* (Prof. P. Sambamurthy)
- Books on Vedantic Philosophy (Swami Yatiswarananda)
- Research books on Neuropsychology (Dr. A. Newberg)
- Journals and Medical Text Books on the Brain (Scientific American)
- Journals on Carnatic *Sangeetham* (Indian editions)
- CDs / Internet, U tubes (Downloads)
- Devotional lectures by Swamis and Search in Libraries (Attendance)

3.9.1.1 INTERPRETATIVE PHENOMENOLOGICAL ANALYSIS (IPA)

The Qualitative methodology applied for the analysis, comprehension and conclusion is Interpretative Phenomenological Analysis (IPA). It has its theoretical

origins in phenomenology and hermeneutics. Phenomenological methods are particularly effective at bringing to the fore the experiences and perceptions of individuals from their own perspectives, and therefore the approach challenges the structural hypothesis. The adding of an interpretive dimension to phenomenological research will enabling it to be used as the basis for practical theory and will allow it to inform, support or challenge policy and action. (Stan Lester, 1999:1). The hermeneutic phenomenological research emphasizes on the metaphysical stance, methodological grounds, quality concerns and ethical issues that contribute to its paradigmatic assumptions. Finlay (2009:45) further states that applied to research, phenomenology is the study of phenomena: their nature and meanings. The focus is on the way things appear to us through experience or in our consciousness where the phenomenological researcher aims to provide a rich textured description of lived experience (Narayan Prasad Kafle, Katmandu University, 2011:181)

Through the IPA methods the researcher aims to gather an in-depth understanding of Devotional music of Swami Tyagaya, his behavior towards God, his Spirituality, the Brain science and the reasons that govern such behavior. IPA has a good balance of phenomenological description with insightful interpretation. It has a degree of transparency (contextual detail about the sample, a clear account of process, adequate commentary on the data, key points illustrated by verbatim quotes). Phenomenology of Swami Tyagaya is concerned with the study of experience from the perspective of the individual and it emphasizes the importance of personal perspective and interpretation. Phenomenological approaches are based in a paradigm of personal knowledge and subjectivity. The Hermeneutics deals with the

interpretation of Swami Tyagaya's vision of God and the devotional wisdom and the Vedantic, philosophical or religious texts.

The IPA encourages an open-ended dialogue. It offers insight to see things in a new light because of its combination of psychological, interpretative, phenomenological, hermeneutics and ideographic components. It is an approach to psychological qualitative research with an ideographic focus, which means that it aims to offer insights into how a given person, in a given context, makes sense of a given phenomenon. Usually these phenomena relate to experiences of some personal significance; such as a major life event, or the development of an important relationship. IPA usually requires personally-salient accounts of some richness and depth, and it requires that these accounts be captured in a way which permits the researcher to work with a detailed literal transcript.

This IPA approach emphasizes four main levels which are as follows.

1. Identification and documentation
2. Investigation and compartmentalization
3. Intepretation and analysis
4. Integration and conclusion

The Identification and Documentation is the first stage. The study will obtain the principal data for identification and documentation from the relieble text books like Shastria Carnatic *Sangeetham*, Swami Tyagaya's life and works, Neuropsychology, Vedantic and Spiritual Books as primary source. The secondary source will obtain the relavent materials from research papers on Neuropsychology,

Journals, CDs / Videos – interviews of musicians, devotional lectures by commentators, Swamis and Gurus, related books, academic exercises, seminar papers, reference books and magazines. The primary and secondary source informations will be identified, scrutinized and documented. All these materials are useful to substantiate the study.

The Investigation and Compartmentalization is the second stage. The documented data will be investigated and co-related for detailed comprehension, evaluation and assimilation. Then, the meterial will be sheduled for compartmentalization in chapters. The subject matter and the data which are compartmentalized are analyzed carefully for correlation of meaning in the correct chapters. The main divisions of analysis are, introduction, rationale, statement of study, objective, literature review, methodogy, theories, lmplication and conclusion. Care will be taken not to repeat ideas

The Interpretation and Analysis is the third stage. The study will facilitate the significance of the current research objective. The analyzed data will be treated accordingly and appropriately to fulfill the objective that Tyagaya's devotional music findings corroborates with the evidences of the neuro-science.

The Integration and Conclusion is the last stage. The study will scientifically rationalise and substantiate the findings and discuss and integrate the evidences gathered from the data. The conclusion is drawn based on the *Sangeetham,* Tyagopanishad, Neuropsychology and Spiritual philosophy.

3.9.2 JUSTIFICATION OF INTERPRETATIVE PHENOMENOLOGICAL ANALYSIS

The study finds it appropriate to choose " Interpretative Phenomenological Analysis" (IPA) because, it is an psychological qualitative research with an ideological focus, which means that it aims to offer insights into how a given person, in a given context, makes sense of a given phenomenon. This phenomenon can be scientifically rationalized and there are sufficient evidences to prove it right. These phenomena is relate to experiences of some personal significance, such as a major life events, or the development of an important relationship or a major experience or an emotional perception.

The IPA method is distinct from other approaches because of its combination of psychological, interpretative science and ideographic components. It appears most appropriate for qualitative phenomenological psychology. It elicit an in-depth understanding of meanings of human practices, culture, works of art and science texts. Phenomenological analysis is based on discussions and reflections of direct sense perception and experiences of the researched phenomenon. The Conclusion of the research will be based on deductive method and scientific corelation method. The understanding is produced through systematic interpretation of the scientific and survey processes. Therefore the selection of "Interpretative Phenomenological Analysis" (IPA) will be effective and useful for literature review.

The study with IPA attempts to understand the rationale by demonstrating that Swami Tyagaya's spiritual *Sangeetham* plays a prominent role in the brain and the brain creates the visual imagery of God. It also studies how modern

neuro-psychology approves this “God - Image” in the brain? It endeavors to attain the spiritual phenomenon and explains the benefit of spirituality to the society.

3.9.3 QUANTITATIVE METHODOLOGY

The Quantitative methodology adopted in this research is in the form of a field survey and a laboratory Electroencephalogram (EEG) experiment. The two studies are basically an investigative, assimilative, and inference related review. The survey is subjective and the EEG is objective.

3.9.3.1 Questionnaire Survey (Subjective Analysis)

Swami Tyagaya attributed Lord Rama as God. Different religious traditions assign differing attributes and characteristics to God. God is great for the believer’s mental, physical, and spiritual health. The study attempts to comprehend the precise implications of Swami Tyagaya’s *Sangeetham* and God's attributes. The study also comprehends wide-reaching views of people’s religious, devotional, musical, neuro-psychological and spiritual experiences. The survey is conducted in a national level. Eventually, the researcher conducts a statistical analyses, inference and conclusion with the collected data.

3.9.3.2 Pilot study & Questionnaire Validity and Rules

i. The purpose of a pilot study is to test the effectiveness of a questionnaire on a limited number of people before the main survey is conducted. The flaws like unclear instructions, repetitions, ambiguity, excessive length, bias statements are corrected. The Pilot study is based on quantitative and qualitative methods. A self administered pilot questionnaire is conducted for a selected experts and members of community.

ii. The questionnaire probes the design, the development, the reliability and the validity of *Sangeetham*, Swami Tyagaya, brain and spirituality by formulating basic rules and using statements which are interpreted easily by members of the society. It uses positive statements and avoids negatives or double negatives. It uses clear and comprehensible wording, easily understandable for all educational levels. It uses correct spelling, grammar and punctuation. The questions are not prejudicial but inadvertently, a few questions are leading the candidates towards an answer in order to elicit a clear view.

iii. The survey is a most commonly used tool in a research. This survey produces valid and reliable demographic variable measures and yields valid and reliable individual disparities that self-report scales generate. The first part of the survey simplifies the concept for statistical significance as much as possible so that non-technical readers can use the concept to help make decisions based on their data. The second part provides more technical importance so that a fuller discussion of the subject is necessary for statistical significance. The Questions investigates on *Sangeetham*, Swami Tyagaya, Brain, God and theology. The study also surveys the frequency of the participants' devotional attendance, society work, religiousness and spirituality. The survey assesses the participant's spiritual experiences measured by statistical indices. It measure the statistical interpretation on *Sangeetham*, Swami Tyagaya, Brain, religion and spirituality. The Survey is compared with the report of other researchers in order to acquire the perception of God, spirituality and devotional music between the Malaysian Indian society and the European society.

3.9.3.3 Study Time period, Areas, Ethics, and Purpose

The Survey was distributed on the 1st December 2013 and collected on the 30th March 2014. The majority of the participants are those who are from an Indian cultural background. The Questionnaire is focused to get the views of the Malaysian Indian population. The survey addresses respondents' views on devotional *sangeetham*, Swami Tyagaya, consciousness, brain, social, and religious issues. Questionnaire sheets were printed and distributed by hand to the candidates and also electronically sent. The representatives were requested to be responsible for the distribution and receiving the questionnaire. The anticipated time to complete the questionnaire was approximately thirty minutes. However they were welcome to take as much time as they needed. Ethics approval was obtained from the representatives. An introduction letter and candidate consent letter was given for the candidates to put their signature.

The purpose the survey is to obtain information about spiritual experiences and how candidates relate to various belief systems. Candidates were asked to provide information regarding their spiritual experiences and their understanding of devotional music, Swami Tyagaya, brain activity and spirituality. The candidates were asked to relate about their existential experiences and beliefs.

3.9.3.4 Confidentiality, Address, Distribution, Number of Respondents

3.9.3.4.1 Confidentiality

Every attempt is made to maintain strict confidentiality for all information collected in this project. If in due course of any publications or presentations of the

result, the participant will not be identified by name. However, excerpts of their comments may be used as examples.

3.9.3.4.2 Distribution

The questionnaire was distributed randomly through interested friends and their family members. The respondents replies are accessed through the same sampling based on willingness to participate in the study. The respondents are mostly adults, family personals, professionals, educated members, musicians, religious teachers and students. All are accessed through the same sampling process. However, their willingness to take part in the study takes precedence. This survey is conducted via two important questionnaire methods: i. the printed and electronic method. Most of the printed Questionnaires are distributed to the general community such as professionals, theologians, musicians, students, families, colleagues, strangers and friends and some questionnaire are electronically sent to doctors, professionals, associates, strangers, acquaintances, friends and their friends.

3.9.3.4.3 Number of Respondents

This quantitative questionnaire data collection method responded with 410 despondences and their replies. The response rate was quite high and this meant that the using of the quantitative questions for random probes were positive for the outcome of the study. There are no shortcomings and complaints. The language is not a barrier because all the respondents are English educated. The exercise is generally well received by the responders although the exercise required a lot of time and patience.

3.9.3.4.4 Sampling & Assessment Procedures

The survey procedure comprises of:

i) Qustionnaire design and distribution

ii) Answers documentation

iii) Statistical analysis and Intepretation

iv) Discussion and Conclusion

The questionnaires are designed and developed to estimate the psychometric values. Psychometrics is a study concerned with the theory of psychological measurements. One part of the field is concerned with the objective measurement of skills and knowledge, abilities, attitudes, personal achievement. For example, the construction and validation of assessment instruments such as questionnaires and personality tests. Another part of the field is concerned with statistical research bearing on measurement theory for example, the validation of item response and correlation theory. The psychometric research is what has led to the development of experimental psychology and standardized testing *(https://en.wikipedia.org/wiki/ Psychometrics).*

The survey Questionnaire is designed to estimate the psychometric values of the society's awareness on Swami Tyagaya's devotional kritis and other saints' (*Appar, Sundarar, Thirunavukarasar, Manikavasagar* etc) devotional compositions. The questionnaire protocol is supported by a logical and systematic framework for better comprehension of the philosophy of *Sangeetham* (devotional music), Swami Tyagaya, neuropsychology and spirituality. The Questionnaire is designed to

demonstrate the reliability and validity of the candidates' knowledge on *Sangeetham*, God, neuro-psychology and spirituality. Therefore, a non prejudicial approached is maintained for the protocol. The purpose of this questionnaire protocol is to obtain information about their spiritual experiences in association to the various belief systems. The protocol is asking participants to provide information regarding their spiritual experiences with their religion or *Sangeetham* or devotional music or spiritual talks or religious books. The participants are also asked about their existential experiences and the relationship to the brain and mind complex. The Questionnaire contains A and B sections. The Section A is a collection of demographic information and section B deals with questions about *sangeetham*, Swami Tyagaya, brain, meditation and spirituality. Absolute care is taken to create a reliable research.

The survey contains Eighty two Questions. The answers are considered based on the 5-point Likert-type scale. The answers are arranged in ordinal scales which measure levels of agreement and disagreement. The scale assumes that the strength and intensity of experience is linear, which is based on a range from strongly agree to strongly disagree. The participants are requested to scale their answer based on the Likert scale of 1-5. Example, (Strongly Disagree, Disagree, Undecided (neutral), Agree, Strongly Agree). The Questionnaire protocol also includes a validated tool survey which was previously published by Genia, V. (1991). The spiritual experience index: A measure of spiritual maturity. *Journal of Religion and Health*, *30*, 337-347. Here, a section of the questionnaire is simplified to extract the answers with a YES; NO, Don't know range. This scale is most widely used in survey research.

When the questionnaires are completed, the answers are further analysed. The answer data collected are entered into The Statistical Package for the Social Sciences (SPSS-22), software system which is used for statistical analysis and prediction. A consensus based assessment is created and validated on the society's prediction on *Sangeetham*, Swami Tyagaya's devotional compositions, neuro-psychology and the spiritual transformation.

The statistical null hypothesis testing is reported for the study based on the questionnaire survey statistics. The six statistical hypothesis tests are conducted for statistical inference with the assistance of the survey statistical data. The statistical data is compared with the synthetic data as an alternative null hypothesis. The comparison is regarded statistically important according to threshold probability. The Six Null Hypothesis statements of Inferential Tests are also conducted for the study. The survey results are reported with the Six Null Hypothesis statements of Inferential (Hypothesis) Tests. Inferential analysis was conducted with the methodology of Cohen, J. (1988).

3.9.4 The Six Null Hypothesis statements discussed for six alternate statements

i. Nul HO_1 : There is no significant relationship between *Sangeetham* (Indian Classical music) and devotional experience among Indians.

ii. Nul HO_2 : There is no significant relationship between *Sangeetham* and general perception on God, brain science and devotional experience among Indians.

iii. Nul HO_3 : There is no significant relationship between *Sangeetham* and Neuropsychology among Indians.

iv. Nul HO_4 : There is no significant relationship between devotional *Sangeetham* and holiness among Indians.

v. Nul HO_5 : There is no significant relationship between devotional reliance and spirituality among Indians.

vi. Nul HO_6 : There is no significant relationship connecting God, brain, devotional *Sangeetham* of Swami Tyagaya and spirituality among Indians.

The six sections of the study scrutinized are: 1. Demography of the participants; example-age, gender, town, education, believes, occupation. 2. Questions on *Sangeetham* and other devotional composers 3. Questions on spiritual experiences. 4. Questions about Tyagaya's devotional songs 5. General perception of God, brain and spirituality. 6. General perception of devotional music. The questionnaires are designed and developed to estimate the psychometric values of the emotional measurements. Multiple composite indexes are created to assess the *Sangeetham* knowledge, Divine consciousness, spiritual faith and meditation across age, race, gender, education, income denomination, family status and spiritual health status. The above six hypothesis are anticipated to be reject by six alternate statements during discussion in chapter five.

3.9.5 CONCLUSION

This chapter introduces the theoretical techniques and the principles associated with the review of literature and the questionnaire survey. It embraces concepts and models for the qualitative and quantitative methods. It offers an understanding for the methods applied to derive at specific results. The study adopts for the review of literature the Interpretative Phenomenological Analysis (IPA) method which is a

popular approach for qualitative inquiry. IPA is phenomenological in its attitude that it explores Swami Tyagaya personal perception of *Sangeetham*, and spirituality. The study attempts to construct a philosophical science of consciousness in neuro-psychology. The quantitative methodology deals with the procedure-ethics-purpose and time period, Pilot Study, Confidentiality and Distribution. The study handles different statistical scales of 5 point Lickert scale; Psychometric values, The Statistical Package for the Social Sciences (SPSS-22), The statistical null hypothesis testing and Six Null Hypothesis statements of Inferential Tests on the values of *Sangeetham*, Swami Tyagaya, the brain, devotion and spirituality.

3.10 METHODOLOGY - ELECTRO ENCEPHALOGRAM (EEG)

Over the past three decades, developmental neurobiologists have made tremendous progress in defining basic principles of brain development. Brain science has changed the dimension of brain development. The relationship between brain and behavioral development is viewed as separate entity. The key to understanding the origins and emergence of both the brain and behavior lies in understanding how inherited and environmental factors are engaged in the dynamics and interactive processes of the neurobehavioral system. Brain maturation and experience enables behavioral development. The environmental factors influence the brain development and its activity. The influence of external activity can bring neuro-plastic changes that can produce emotional expositions. The brain cell produces electrical activity which can be recorded on a graph and is called electroencephalogram. The recording on the graph can be interpreted by an expert.

3.10.1 Electroencephalography

Electroencephalography (EEG) has been used in many brain studies as a primary method for evaluating the electrical activities in the brain. Electroencephalography uses electrical leads placed on specified areas on the scalp to measure the electrical activity. The EEG measures the electric fields by frequencies and amplitudes. The EEG is able to measure the activity of a portion of the brain cells to the millisecond scale. EEG is safe and non invasive. The recorded electrical waveforms are represented as signals. The signals are Delta, Theta, Alpha and Beta.

The five main EEG signals are based on the frequency of the activity, ranging from low frequency Delta waves have less than 4 Hz, commonly found during sleep and deep meditation. The Theta waves have a frequency of 4 to 8 Hz, and is usually experienced during light sleep or extreme relaxation. With practice and experience it is possible to reach the Theta state through meditation and devotional singing. The Alpha waves have 8 to 12 Hz, is a wakeful state but relaxed and not processing much information. The Alpha state is a very calming and enjoyable state of consciousness.. The Beta waves have 13 to 30 Hz, associated with an awake and alert brain. It is the most common mental state which is the wakeful state during the day. However, many people don't experience enough Beta activity in their brain, which can cause mental disorders such as depression, ADD and insomnia. Gamma waves function at the highest and fastest range in the brain at more than 40 Hz. It. is experienced during super high levels of focus, and periods of peak cognitive functioning which is an intense state of energy, and mind alertness.

3.10.2 Application of the EEG Technology

The new generation of EEG machines are considered beneficial to assess the physiological brain activities. With the EEG, about 20 regions of the human brain are modelled and simulated. The waves are converted to signals which are processed and compared to the performance of the human brain regions. The brain creates the thoughts and the thoughts create the emotions. The amount of data gathered about the brain is increasing each year. The EEG technology has enlightened the brain activity in association with Swami Tyagaya's devotional *Sangeetham* and the related psychology. There are modern brain image scanning procedures like fMRI and PET scanners which are considered beneficial. The scanners are capable of imaging individual interneuron connections and seeing them interact in real time. (This technology is done in this study). The EEG experiment in this study has turned into an excellent working model and has shown impressive results of the human brain functioning.

3.10.3 The EEG research is based on the Literature guideline

1. "An Electroencephalographic study on the Zen meditation" (ZAZEN): Akira Kasamatsmu. D and Tomio Hiraim, Psychiatry Neurology Journal, Japan (1966).
2. This study is based on the validated work done by Sundarachari R, Dhanasree Naidu, Kokiwar PR, Surendra BV. The study is called "Effect of Meditation on Electro Encephalographic graph (EEG), Blood Pressure, Heart Rate and Respiratory rate" published MRIMS, Journal of Health Sciences, Volule1, Issue 2, (July- December 2013).

3. Based on "Cerebral blood flow differences between long-term meditators and non-meditators". Andrew B. Newberg, Nancy Wintering, Mark R. Waldmanb, Daniel Amenc, Dharma S. Khalsa, Abass Alavia. Center for Spirituality and the Mind,University of Pennsylvania, United States (https://cerebral blood flow/ meditators.Pdf).

3.10.4 Significance of the study with 3 Control groups

This EEG study demonstrates specific electrical wave changes in the brain of Group A vs the Control Groups B and C.

i. Group A - Swami Tyagaya Devotional *Sangeetham* (Adults - Pilot group - Long term exposed to Swami Tyagaya's devotional singing)
ii. Group B - Non Tyagaya devotional singing (Students)
iii. Group C- Non Tyagaya devotional singing (Adults).

3.11 Ethics approval, Consent letter and location

Participants are offered a small reimbursement. Ethics approval is obtained from the representatives. An introduction letter and candidate consent letter is given for the candidates to put their signature.

3.12 The Plan for the EEG experiments

a) Guideline and Laboratory methods
b) Aim, Investigation and documentation
c) Analysis and Intepretation
d) Discussion and Conclusion

3.13 Background

The objective of this EEG experiment is to determine if there are differences in baseline brain function of experienced Devotional Singers of Swami Tyagaya's *Sangeetham* (meditators) and compared to non-Tyagaya Devotional Singers (meditators). The application of Devotional singing has a fixed implication in the brain. It is the explanation of the *bhakti rasa*. In fact, one can use Science for spiritual exploration. The concept that is associated with *Sangeetham* and spiritual dimension can be examined with necessary research tools applied to the brain in order to learn the architecture and physiology of the brain. With the EEG, the psycho-neurological properties of the brain and external personality traits that characterize this meditative devotional singing state has been adequately studied in three groups of candidates.

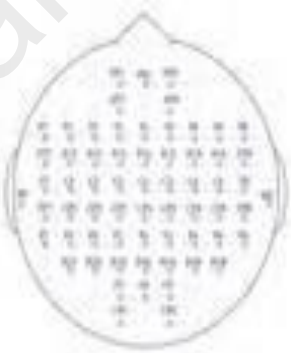
3.14 Methods

The study quantitatively analyzes the EEG changes with neuro-psychological parameters of all 34 volunteers. The Group A comprises of 12 healthy volunteers of minimum 10 years duration of devotional singing of Swami Tyagaya's *Sangeetham*. The Group A, EEG signals are compared with the EEG signals of 2 control Groups B and C. The Group B comprises of 12 young University student volunteers with no knowledge of Tyagaya devotional songs and the Group C comprises of 10 adults volunteers of non Tyagaya devotional songs. The quantitative findings of the EEG changes in neuro-psychological parameters are compared between the 3 groups of A, B and C (A is the Pilot group; B and C are the control groups). The EEG experiment are recorded in 3 groups of 12

+12 +10 volunteers. The total is 34 volunteers. The EEG was done at The Bio-Engineering Dept, University of Malaya, Kuala Lumpur, Malaysia.

3.15 EEG machine, EEG cap electrodes and voltage

Programmable functions include: Montage Manager and figures, filters, scales, time division, EEG process pattern, stimulator, review and recording panels, reanalysis tools, video EEG data extraction, automatic and editable report generator.



1. EEG machine etc. International 10–20 System

   - software used Profile Study Room version 2.4.444

   - amplifier model Medelec Profile

2. EEG electro cap

   - 19 channel electrode (not included reference and ground)

   - impedance set to 10 ohm

   - sampling rate used 256 Hz

3. Electro gel

   - Electro gel used for electrode conduction

(https://www.google.com/search?q=EEG+machine+etc.+International)

3.15.1 Theoretical Formula

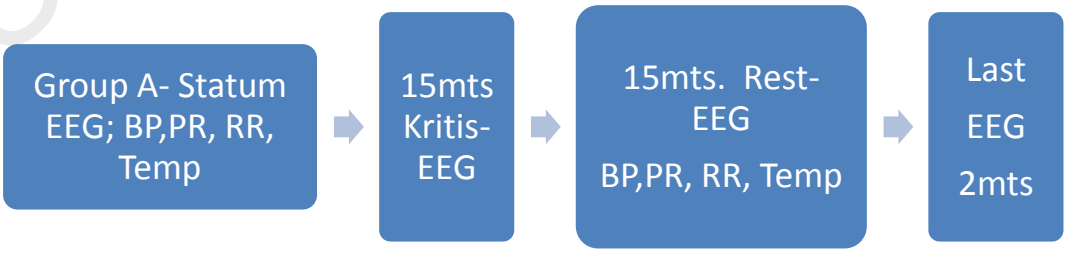
The study is to determine if there are differences in baseline brain function of experienced Devotional *Sangeetham* Singers of Swami Tyagaya's compositions (meditators) and compared to Devotional Singers (non-Tyagaya). The EEG will evaluate the effects of electrical signal (religiousness) on the human brain by the input of Swami Tyagaya's devotional classical music verses non-Swami Tyagaya *sangeetham*.

This study leads to a practical system for non-invasive assessment of the emotional states in devotional singing applications. The study observes the brain electrical impulses associated with long-term devotional meditative singing and spiritual perception. This study investigates the brain activity in emotional relaxation and God realization by measuring the alpha, beta, delta and theta brain activity in the frontal (F3–F4), central (C3–C4), parietal (P3–P4), and occipital (O1–O2)electrode placements using the International 10–20 System EEG.

3.15.2 The Research Procedure

- The volunteer is seated in a comfortable chair, relax and clear mind
- Both eyes close with eye mask for 2 min
- Participants were healthy and capable of hearing well.
- Swami Tyagaya's carnatic bhakti composition used for procedure for Group A only are from the CD (*Sangeetha*) - sung by Dr. M. Balamurlikrishna). The *kriti*s were 1. *Meluko dyaanidi* in *raga saurashtra,* 2.*Hecherika* in *raga Kambhodi,* 3. *Kasheerasagara* in *raga Anadaha bairavi*, 4. *Melukovaya* in *raga Bouli*, 5. *Seethakalyana* in *raga Shankarabharnam*, 6. *Nagumomu* in *raga Madyamavati*
- EEG data recorded for 2 minutes (1st EEG)
- Both eyes close with eye mask for 15 min while listening to the music
- EEG data recorded for 2 minutes (2nd EEG)
- Both eyes close with eye mask - rest and relax for 15 min, no music
- EEG data recorded with eyes close (3rd EEG)
- 2 min latter EEG data recorded with eyes open (4th EEG)
- At the end, the electrodes are gently removed and volunteer retire

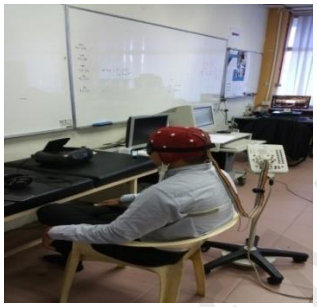
1. EEG 2 min. – 2. EEG 2 min. – 3. EEG 2 min. – 4. EEG 2 min.



3.15.3 Associated Tests

The heart rate, body temperature, hypertension before and after the EEG are assessed. A simple 10 point viva questionnaire on spirituality and devotional *Sangeetham* of Swami Tyagaya are conducted. The volunteers particulars and simple questions are recorded.

Portraits of Candidates at the Laboratory


3.15.4 EEG for recordings and Interpretation

The recorded EEG graphs are read by an expert neurologist for the interpretation of the electrical signals. The EEG signals are recorded and scrutinized for errors. The final corrected signals are processed further and again read for positive findings, correlations and inferences.

3.15.5. Survey and EEG Implications

The validity of the subjective quantitative and objective empirical studies identifies significant links between Swami Tyagaya's *Sangeetham*, devotional music, religion, spirituality and mental health. The Questionnaire survey assesses the society's frequency of devotional attendance, self-rated religiousness and spirituality and also the knowledge of Swami Tyagaya, devotional music, God, brain, and theology.

The EEG measures the brain signals of thirty four volunteers. The implication is to specify how or why devotional music of Tyagaya or other saints influence good physical health, excellent mental health, compassion, spirituality and the mental vision of God. The future implication for these associations, however are for the usefulness of the society.

3.16 CONCLUSION

This chapter explains the qualitative methodology of IPA and the two quantitative methodology used for the study. A quantitative subjective methodology of a questionnaire survey with The Statistical Package for the Social Sciences, (SPSS), is used for statistical analysis. The questionnaire is designed and developed to estimate the psychometric values of the psychological measurements and the reporting resulted with the Six Null Hypothesis statements of Inferential Tests. Multiple composite indexes are created to assess consciousness, spiritual faith and meditation across age, race, gender, education, income denomination, family status and spiritual health status.

The EEG experiment measures the brain electrical activity of selected volunteers who are influenced by Swami Tyagaya's *Sangeetham* and devotional music. The EEG research is the key to understand the dynamics of Tyagaya's devotional *Sangeetham* and the emergence of both the brain and behavior lies in understanding the interactive processes that define and guide the development of the neurobehavioral system on God.

CHAPTER FOUR

THE FINDINGS OF QUESTIONNAIRE SURVEY AND THE EEG EXPERIMENT

4.1 INTRODUCTION

This current chapter reports the finding provided by questionnaire survey and the results of the EEG experiments. *Sangeetham*, Swami Tyagaya, brain, God and spirituality are discussed in the review of literature of Chapter Two and the Methodology of the study is discussed in Chapter Three. The EEG is also discussed in the literature review and the methodology and procedure are discussed elaborately in Chapter Three. The findings of the survey and the EEG signals are reported in this current chapter. The finding provided by questionnaire survey is in response to the rating scales and the findings provided by the EEG experiments are reported here. It can be seen that the findings on the Questionnaire survey data are based on the participant's spiritual practices and beliefs related to *Sangeetham*, Swami Tyagaya, Consciousness, brain, spirituality, devotion and meditation. The findings on the EEG experiments are based on the volunteer's brain electrical activity.

The survey findings show the public perception on devotional music, mediation God and spirituality. The majority findings can be seen from the response to the questions on the existential experiences, cultural values and related feelings on God, faith, brain and Swami Tyagaya. The questionnaire protocol comprises of 6 sections and 80 questions. The survey findings relates to

the practice of religion, meditation, prayer and other spiritual beliefs related to consciousness, devotion, brain, and spirituality. It can be seen through the findings that the logistic regression predicts the candidates believe in spirituality and devotional experiences. The questionnaire survey and the findings are based on the Statistical Package for the Social Sciences (SPSS) software system is used for statistical analysis. Multiple composite indexes are created to assess consciousness, spiritual faith and meditation across age, race, gender, education, income denomination, family status and spiritual health status. The participants are questioned about their existential experiences and beliefs and related feelings on God, faith, brain, *sangeetham*, devotional music, mediation, spirituality and Swami Tyagaya. The findings are based on a correlation study.

In this modern scientific era, one can use Science for spiritual exploration. The concept associated with *sangeetham* and spiritual dimension can be examined with necessary research tools applied to the brain in order to learn the architecture and physiology. The EEGs are expected to record electrical signals through activity in the brain region involved in emotional processing by the input of devotional *sangeetham* and thus focusing the brain area for 'God Realisation'.

4.2 FINDINGS OF QUESTIONNAIRE SURVEY

The study first reports the statistical and demographical findings of the local Indian society. Secondly, the study reports the essential findings of the questionnaire survey to establish the background knowledge of *Sangeetham*, Swami Tyagaya, brain, and its relevance to God and devotion. The statistical data

provides the understanding of the thesis to satisfy the devotional situation and the mental aspect in the vision of God. The demographical information will determine the significance of the scientific rationalization of Tyagopanishads with neuro-psychology and to record the spiritual growth. The findings can make significant impact on the relevance of the survey to the thesis over the perception of Swami Tyagaya's *sangeetham*, devotion and God.

4.2.1 Demography and statistics findings. (Table 1 to 5)

a. Gender

The female participant 64.9% were about two times more than the male paricipants of 35.1% denoting that the female distributation was more which may imply that they are naturally inclined favourably to religious belief. The keen interest of the women for devotional music and religious growth inspires the survey.

Table 1: Gender Division

	Frequency	**Percent**
Female	266	64.9
Male	144	35.1
Total	410	100.0

b. Age

The Participants less than 30years old comprised 43%; and more than 30years old were 58%. There were a good mixture of young and old people. The paricipants of 60 years and above were 14%. There were variation in age findings.

Table 2: Age Division

Age	Frequency	Percent
Less than 20 years old	22	5.3
20-29 years old	156	38.0
30-39 years old	81	19.8
40-49 years old	53	12.9
50-59 years old	41	10.0
60 years old and above	57	13.9
Total	410	100

c. Education

A high proportion of the participants up to 76% were college educated. The secondary education participants were 20%. The observation is that about 96% of the survey group were from an educated participants. The educated participants command a significant value for the understanding of the philosophic subject of the questionnaire.

Table 3: Education level

	Frequency	Percent
Primary	16	3.9
Secondary	81	19.8
Tertiary	313	76.3
Total	410	100.0

d. Occupation

The survey shows 49.5% professionals and 29.8% were university students and retired participants were 5%. These values corresponds to the significance of their participation.

Table 4: Occupation

	Frequency	Percent
Unskilled workers/labourers	2	.5
Skilled workers	12	2.9
Clerical, sales and services workers	13	3.2
Own Business	16	3.9
Retired	20	4.9
Not working	22	5.4
Student	122	29.8
Professional	203	49.5
Total	410	100.0

e. Socio-economic

In the socio-economic sector 86.8% were from the middle income group and 9% Upper income participants.

Table 5: Socio-economic Level

	Frequency	Percent
Lower	17	4.1
Middle	356	86.8
Upper	37	9.0
Total	410	100.0

4.2.2 Findings on Devotional *sangeetham* reliance (Tables 6 to 9)

The survey reports the essential findings from the questionnaire survey to establish the background knowledge of *Sangeetham*, Swami Tyagaya, brain, and its relevance to God and devotion. The findings will make significant impact on the relevance of the survey to the thesis over the perception of Swami Tyagaya's *sangeetham*, devotion and God. The statistical data provides the understanding of

the study to satisfy the devotional situation and the mental aspect in the vision of God.

1. To the question, Do you enjoy listening to Carnatic Shastria *Sangeetham*? The findings indicate that 75.2% enjoy listening to Carnatic Shastria *Sangeetham*. The total participants were 410 . The finding percentage indicates keen interest for Carnatic Shastria *sangeetham*. The 75.2% of Carnatic Shastria *Sangeetham* admirers inspires the survey.

Table 6: Do you enjoy listening to Carnatic *Shastria Sangeetham* (South Indian classical music)

		Frequency	**Percent**
Valid	Not at all	37	9.0
	Very little	65	15.9
	Often	109	26.6
	A lot	88	21.5
	All the time	111	27.1
	Total	410	100.0

2. To the question, Do you listen to devotional music or *keerthana*s? 88.5% enjoy listening to Carnatic *Sangeetham*. The finding percentage indicates keen interest for devotional *sangeetham* and the findings inspires the survey.

Table 7: Do you listen to devotional music or *keerthana*s?

		Frequency	**Percent**
Valid	Not at all	16	3.9
	Very little	31	7.6
	Often	80	19.5
	A lot	125	30.5
	All the time	158	38.5
	Total	410	100.0

3 To the question, Do you consider singing devotional music to be an important part of life ? The findings denotes 90.3% enjoy listening to Carnatic *Sangeetham*. The finding percentage indicates that singing devotional *sangeetham* is important practice in life.

Table 8: Do you consider singing devotional music to be an important part of life?

		Frequency	**Percent**
Valid	Not at all	21	5.1
	Very little	19	4.6
	Often	60	14.6
	A lot	138	33.7
	All the time	172	42.0
	Total	410	100.0

4. To the question, Do you consider singing devotional songs a form of meditational exersice? The finding indicates that 86.4% consider singing devotional songs as a meditational exercise to the brain. The finding percentage implies that singing devotional *sangeetham* is important exercise.

Table 9: Do you consider singing devotional songs a form of meditational exersice?

		Frequency	**Percent**
Valid	Not at all	24	5.9
	Very little	32	7.8
	Often	87	21.2
	A lot	120	29.3
	All the time	147	35.9
	Total	410	100.0

4.2.3 Findings on Swami Tyagaya, his devotional *keerthana*s and spiritual factors. (Tables 10 to 14)

1. To the question, Do you think that it is possible for Swami Tyagaya a great saintly musician of the 17th century to have visualised God Rama? The findings indicate that 49.8% agree in Swami Tyagaya visualising Lord Rama. The finding percentage indicates that 18.8% disagree. The 49.8% value of the findings inspires the concept of the study.

Table 10: Do you think that it is possible for Swami Tyagaya a great saintly musician of the 17th century to have visualised God Rama?

		Frequency	Percent
Valid	Strongly disagree	50	12.2
	Somewhat disagree	27	6.6
	Neutral	129	31.5
	Somewhat agree	113	27.6
	Strongly agree	91	22.2
	Total	410	100.0

2. To the question, Swami Tyagaya expounds that Devotional *Sangeetham* is important to understand God. Do you agree? The findings indicate that 53.9% ageee in Swami Tyagaya view that his devotional *sangeetham* is important to understand God. 17.8% of candidates disagree. The 49.8% value of the findings inspires the idea of the study that devotional *Sangeetham* is important to understand God.

Table 11: SwamiTyagaya expounds that Devotional *Sangeetham* music is important to understand God. Do you agree?

		Frequency	**Percent**
Valid	Strongly disagree	54	13.2
	Somewhat disagree	19	4.6
	Neutral	116	28.3
	Somewhat agree	116	28.3
	Strongly agree	105	25.6
	Total	410	100.0

3. To the question, Do you agree Swami Tyagayas poetry shows ways to be spiritual and understand God? Swami Tyagaya expounds that Devotional *Sangeetham* is important to understand God. The findings indicate that 52.5% agree in Swami Tyagaya view that his devotional *sangeetham* is important to be spiritual and understand God. 21% of candidates disagree. The 52.5% value of the findings motivates the idea of the study.

Table 12: Swami Tyagayas poetry shows ways to be spiritual and understand God. Do you agree?

		Frequency	**Percent**
Valid	Strongly disagree	54	13.2
	Somewhat disagree	32	7.8
	Neutral	109	26.6
	Somewhat agree	109	26.6
	Strongly agree	106	25.9
	Total	410	100.0

4. To the question, Do you agree, Tyagaya's compositions direct the right path in life? The findings indicate that 52% agree in Swami Tyagaya view that his

compositions direct the correct path to understand God. 17.6% of candidates disagree. The 52% value of the findings inspires the spiritual idea of the study.

Table 13: Tyagaya's compositions direct the right path in life.
Do you agree?

		Frequency	Percent
Valid	Strongly disagree	45	11.0
	Somewhat disagree	27	6.6
	Neutral	125	30.5
	Somewhat agree	107	26.1
	Strongly agree	106	25.9
	Total	410	100.0

5. To the question, Do you agree Tyagopanishad infuse faith and compassion? The findings indicate that 49% agree that Swami Tyagaya's compositions infuse faith and compassion. The 49% value of the findings indicates the message of righteousness.

Table 14: Do you agree Tyagopanishad infuse faith and compassion?

		Frequency	Percent
Valid	Strongly disagree	48	11.7
	Somewhat disagree	25	6.1
	Neutral	136	33.2
	Somewhat agree	109	26.6
	Strongly agree	92	22.4
	Total	410	100.0

4.2.4. Findings on God, Brain, Meditation, Spirituality & Faith
(Table 15 to 27)

1. To the question, Do you believe in God? The findings indicate that 97.3% overwhelmingly believe in God.

Table 15: Do you believe in God?

		Frequency	Percent
Valid	No	11	2.683
	Yes	399	97.317
	Total	410	100.0

2. To the question, does God exist? The findings indicate that 87.3% agree in the existence of God and only 5.2% disagree.

Table 16: Does God exist?

		Frequency	Percent
Valid	Strongly disagree	15	3.658
	Disagree	6	1.463
	Neutral	31	7.563
	Agree	79	19.268
	Strongly agree	279	68.048
	Total	410	100.0

3. To the question, is God a mental image? The findings indicate that 46.6% agree that God is a mental image and 34.3% disagree.

Table 17: Is God a mental image?

		Frequency	Percent
Valid	Strongly disagree	108	26.3
	Disagree	33	8.0
	Neutral	78	19.0
	Agree	88	21.5
	Strongly agree	103	25.1
	Total	410	100.0

4. To the question, is God necessary? The findings indicate that 83.9% agree that God is necessary and 5.4% disagree.

Table 18: Is God necessary?

		Frequency	Percent
Valid	Strongly disagree	9	2.2
	Disagree	13	3.2
	Neutral	44	10.7
	Agree	89	21.7
	Strongly agree	255	62.2
	Total	410	100.0

5. To the question, is there a God spot in the brain? The findings indicate that 56.9% agree that there is a God spot in the brain

Table 19: Is there a God spot in the brain?

		Frequency	Percent
Valid	Strongly disagree	40	9.8
	Disagree	26	6.3
	Neutral	111	27.1
	Agree	102	24.9
	Strongly agree	131	32.0
	Total	410	100.0

6. To the question, Does the brain have an attraction towards music? The findings indicate that 83.4 % agree that the brain has attraction for music.

Table 20: Does the brain have an attraction towards music?

		Frequency	Percent
Valid	Strongly disagree	9	2.2
	Disagree	4	1.0
	Neutral	55	13.4
	Agree	120	29.3
	Strongly agree	222	54.1
	Total	410	100.0

7. To the question, Can Saints communicate with God? The findings indicate that 68.5 % agree that Saints can communicate with God and 19.8 % remain neutral.

Table 21: Can Saints communicate with God?

		Frequency	Percent
Valid	Strongly disagree	27	6.6
	Disagree	21	5.1
	Neutral	81	19.8
	Agree	110	26.8
	Strongly agree	171	41.7
	Total	410	100.0

8. To the question, Is God created in the brain? The findings indicate that 68.5% agree that God thought is a creation of one's brain and 18 % remain neutral and 12.7% disagreed to the statement

Table 22: Is God created in the brain?

		Frequency	Percent
Valid	Strongly disagree	32	7.8
	Disagree	20	4.9
	Neutral	77	18.8
	Agree	119	29.0
	Strongly agree	162	39.5
	Total	410	100.0

9. To the question, is spiritual feeling related to God feeling? The findings indicate that 75.9% agree that spiritual feeling related to God feeling and 5.9% disagreed.

Table 23: Is spiritual feeling related to God feeling?

		Frequency	Percent
Valid	Strongly disagree	15	3.7
	Disagree	9	2.2
	Neutral	75	18.3
	Agree	123	30.0
	Strongly agree	188	45.9
	Total	410	100.0

10. To the question, Do you meditate? The findings denote that 55.4 % meditate and the rest of 44.6% do not.

Table 24: Do you meditate?

		Frequency	Percent
Valid	No	183	44.6
	Yes	227	55.4
	Total	410	100.0

11. To the question, Does Meditation improve spirituality? The findings denote that 81 % agree that meditation improve spiritual feelings.

Table 25: Does Meditation improve spirituality?

		Frequency	Percent
Valid	Strongly disagree	8	2.0
	Disagree	14	3.4
	Neutral	56	13.7
	Agree	139	33.9
	Strongly agree	193	47.1
	Total	410	100.0

12. To the question, does repeated meditation singing or chanting activate the brain? The findings denote that 79.3 % agree that repeated meditation singing or chanting activate the brain.

Table 26: Is there a God spot in the brain?

		Frequency	Percent
Valid	Strongly disagree	6	1.5
	Disagree	12	2.9
	Neutral	67	16.3
	Agree	111	27.1
	Strongly agree	214	52.2
	Total	410	100.0

13. To the question, Do you require faith to love God? The findings indicates that 69.5 % agree that faith is required to love God.

Table 27: Do you require faith to love God?

		Frequency	Percent
Valid	Strongly disagree	35	8.5
	Disagree	26	6.3
	Neutral	64	15.6
	Agree	105	25.6
	Strongly agree	180	43.9
	Total	410	100.0

4.2.5 **Findings of Correlation Variables** (Table 28)

The researcher has adopted a non-parametric testing method to record the Correlation Variables of the questionnaire survey. The statistical Correlation of the major variables is based on the Spiritual Relevance of Devotional *sangeetham*, Swami Tyagaya, Brain Science, God and Divine reliance which has produced significant findings to the study. The non-parametric test was employed because the survey results did not show a normal distribution.

The study has identified six major factor dimensions, namely, 1. spiritual factors, 2. divine reliance, 3. brain science, 4. spiritual relevance, 5. God and man and 6. God and brain. These six factor dimensions explain approximately 60 percent of total variation.

Table 28: Correlation among variables

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1.Age								
2.Education	-.081							
3.Family Status	.670**	.177**						
4.Income	.260**	.136**	.251**					
5.God, Brain and Spirituality	.021	-.014	.020	.017				
6.Music	.00	-.012	.05	.036	.480**			
7.Spiritual Experience	.00	.031	.12*	.057	.476**	.477**		
8.Swamy Tyagaya	.00	.012	.20**	.064	.450**	.451**	.515**	
Mean	36.76	2.73	1.92	2.05	4.14	3.73	4.58	3.47
SD	16.50	.522	.98	.36	.59	.81	.79	1.06

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

4.2.6. Findings of Questionnire Survey through the Null Hypothesis Testing method (Table 29 to 34)

The researcher has adopted the Null Hypothesis (HO) testing method to record the inferential finding of the questionnaire survey. The Inferential analysis was conducted with the methodology of Cohen, J. (1988), Statistical power analysis for the behavioural sciences (2nd ed.) Hillsdale, NJ: Lawrence Erlbaum Associates. The design of hypothesis testing is that the events that easily occur by chance and those that are highly unlikely to occur randomly must be differentiated. Such a method should be streamlined and well defined so that

others can replicate the statistical experiments. Hypothesis testing clarifies reductionist analysis and this analysis is prevalent in all statistics and science.

The Null Hypothesis testing engages in the creation of two statements with a hypothesis in a statement that is illogical and unacceptable and the other alternate statement that is logical and acceptable. The Alternate Hypothesis will denote an experimental hypothesis which will have an observed effect of the experiment. The alternate hypothesis will reject the null hypothesis and therefore the alternate hypothesis becomes acceptable. If the null hypothesis is not rejected, then the alternate hypothesis is not accepted.

The following set of negations may in the formation of null and alternative hypotheses. Most technical papers rely on just the first formulation.

- Null hypothesis: "*x* is equal to *y*." Alternative hypothesis "*x* is not equal to *y*."
- Null hypothesis: "*x* is at least *y*." Alternative hypothesis "*x* is less than *y*."
- Null hypothesis: "*x* is at most *y*." Alternative hypothesis "*x* is greater than *y*."

The inferential Correlation test conducted by using Statistical Package for the Social Sciences (SPSS) software system. The finding is determined by referring to the Cohen, (1988) Correlation table.

Strength of correlation	**Remarks**
r = -+ .10 to -+ .29	small (weak)
r = -+ .30 to -+ .49	medium (moderate)
r = -+ .50 to -+ 1.0	large (strong)

Correlation Table (Cohen, 1988)

Findings of Six Alternate Hypothesis in the Null Hypothesis testing

The issues surveyed upon were 1. *Sangeetham* 2. Swami Tyagaya 3. Devotion 4. Brain 5. God and 6. Spirituality.

i) The relationship between *Sangeetham* and devotional experience

HO_1 : There is no significant relationship between *Sangeetham* (Indian Classical music) and devotional experience among Indians.

The investigation using Pearson product-moment correlation coefficient showed there was moderate positive correlation between music and devotional experience ($r = .476$; $n = 410$; $p = 0.00$: $p < 0.01$). The Nul HO_1 is rejected. This finding indicated that traditional music (*Sangeetham*) moderately influences the devotional experience of the Indians.

Table 29**:** Correlation between *Sangeetham* and devotional experience among Indians

		Sangeetham Music	Devotional experience
Music	Pearson Correlation	1	0.476**
	Sig. (2-tailed)		0.000
	Min	33.60	169.77
	Standard Deviation	7.35	29.56
	N	410	410

**. Correlation is significant at the 0.01 level (2-tailed)

ii) The relationship between *Sangeetham*, brain and God and devotional experience.

HO_2 : There is no significant relationship between *Sangeetham* and general perception on God, brain science & devotional experience among Indians.

The investigation using Pearson product-moment correlation coefficient showed there was moderate positive correlation between music and general perception on God, brain & devotion (r = .483; n =410; p=0.00: p<0.01). The Nul HO_2 is rejected. This finding indicates that *Sangeetham* moderately influences the general perception on God, brain & devotional experience among Indians.

Table 30: Correlation between *sangeetham* and general Perception on God, brain and devotional experience among Indians

		Sangeetham Music	General perception on God, brain & devotion experience
Music	Pearson Correlation	1	0.483**
	Sig. (2-tailed)		0.000
	Min	33.60	136.58
	Standard Deviation	7.35	19.77
	N	410	410

**. Correlation is significant at the 0.01 level (2-tailed)

iii) The relationship between *Sangeetham* and Brain

HO_3 : There is no significant relationship between *Sangeetham* and the brain among Indians.

The investigation using Pearson product-moment correlation coefficient showed there was moderate positive correlation between music and brain (r = .456; n =410; p=0.00: p<0.01). The Nul HO_3 is rejected. This finding indicates that Sanggeetham moderately influences the brain activity among Indians.

Table 31: Correlation between *Sangeetham* and brain among Indians

		Sangeetham	Brain - Psycholgy
	Pearson Correlation	1	0.456**
	Sig. (2-tailed)		0.000
Music	Min	33.80	30.17
	Standard Deviation	7.35	5.83
	N	410	410

**. Correlation is significant at the 0.01 level (2-tailed)

iv) The relationship between *Sangeetham* and Holiness (Table 32)

HO_4 : There is no significant relationship between *Sangeetham* and Holiness among Indians

The investigation using Pearson product-moment correlation coefficient showed there was strong positive correlation between music and spiritual holiness ($r = .638$; $n = 410$; $p=0.00$: $p<0.01$). The Nul HO_4 is rejected. This finding indicates that *Sanggeetham* strongly influences the holiness among Indians.

Table 32: Correlation between music and holiness among Indians

		Sangeetham Devotional	Holiness
	Pearson Correlation	1	0.638**
	Sig. (2-tailed)		0.000
Music	Min	33.60	339.94
	Standard Deviation	7.35	48.51
	N	410	410

**. Correlation is significant at the 0.01 level (2-tailed)

v) The relationship between Devotional reliance and Spirituality

HO_5 : There is no significant relationship between devotional reliance and spirituality among Indians.

The investigation using Pearson product-moment correlation coefficient showed there was strong positive correlation between devotional reliance and spiritual (r = .921; n =410; p=0.00: p<0.01). The Nul HO_5 is rejected. This finding indicates that devotional experience strongly influences the spirituality among Indians.

Table 33: Correlation between devotional reliance and spiritual among Indians

		Devotional reliance	Spirituality
Music	Pearson Correlation	1	0.921**
	Sig. (2-tailed)		0.000
	Min	169.78	339.94
	Standard Deviation	29.56	48.51
	N	410	410

**. Correlation is significant at the 0.01 level (2-tailed)

vi) The relationship between God, brain, Tyagaya, *Sangeetham* and spirituality

HO_6 : There is no significant relationship connecting God, brain, devotional *sangeetham* of Swami Tyagaya and spirituality among Indians.

The investigation using Pearson product-moment correlation coefficient showed there was strong positive correlation between general perspective on god, brain & devotional and spiritual (r = .839; n =410; p=0.00: p<0.01). The Nul HO_6 is rejected. This finding indicates that general perspective on God, brain & devotional *sangeetham* of Swami Tyagaya strongly influences the spirituality among Indians. There is significant relationship connecting them.

Table 34: Correlation between general perspective on God, brain & devotional *sangeetham* and spiritual among Indians

		General perspective on God, brain & Devotional *sangeetham*	Spirituality
Music	Pearson Correlation	1	0.839**
	Sig. (2-tailed)		0.000
	Min	136.58	339.94
	Standard Deviation	19.78	48.51
	N	410	410

**. Correlation is significant at the 0.01 level (2-tailed)

4.2.7. **The findings of overall perception** (Table 35 - 39)

The researcher has adopted a an overall perception method to record the general understanding of the questionnaire on Spiritual Relevance of Devotional *sangeetham*, Swami Tyagaya, Brain Science and God.

i) To the statement, "I think that these questions may stimulate your interest in Tyagopanishad and *sangeetham*". The findings denote that 70.2 % of the respondents agree that their involvement in *sangeetham* and Swami Tyagaya's composition will increase.

Table 35: I think that these questions may stimulate your interest in Tyagopanishad and *sangeetham*

		Frequency	Percent
Valid		1	0.2
	No	118	28.8
	Yes	288	70.2
	Yes, No	3	0.7
	Total	410	100.0

ii) To the statement, I believe that these questions may inspire your awareness in devotional music. The findings denote that 78.8 % of the respondents awareness to devotional music will multiply. 20% felt that there will be no change.

Table 36: I believe that these questions may inspire your awareness in devotional music

		Frequency	Percent
Valid		3	.7
	No	82	20.0
	Yes	323	78.8
	Yes, No	2	.5
	Total	410	100.0

iii) To the statement, I trust that these questions may arouse your attention about the God centre in the brain. The findings denote that 78.8 % of the respondents interest in the God centre in the brain will accelerate.

Table 37: I trust that these questions may arouse your attention about the God centre in the brain

		Frequency	Percent
Valid		1	.2
	No	84	20.5
	Yes	323	78.8
	Yes, No	2	.5
	Total	410	100.0

iv) To the statement, I trust that these questions may motivate you towards spirituality. The findings denote that 81 % of the respondents may be motivated towards spirituality and 18.5% felt otherwise.

Table 38: I trust that these questions may motivate you towards spirituality

		Frequency	Percent
Valid		1	.2
	No	76	18.5
	Yes	332	81.0
	Yes, No	1	.2
	Total	410	100.0

v) To the statement, I envisage that these questions may encourage you to reflect on compassion and practice tolerance towards all life forms. The findings denote that 83.4 % of the respondents felt that they were encouraged to practice compassion and tolerance. 15.4 % had negative view.

Table 39: I envisage that these questions may encourage you to reflect on compassion and practice tolerance towards all life forms

		Frequency	Percent
Valid		1	.2
	No	63	15.4
	Yes	342	83.4
	Yes, No	4	1.0
	Total	410	100.0

4.3 CONCLUSION

These six survey findings illustrate relevance to the objective of the study and substantiate to merit the value of the thesis. The survey finding will show the use of spiritual information and advance statistical analysis which can provide subjective and objective evidences on the values of Tyagaya's devotional *sangeetham*. It will be shown from the findings that good data amplifies the voice of the hundreds of volunteer who have come forward to tell their experiential views of *Sangeetham*, Swami Tyagaya, brain, devotion, God and spirituality.

The Questionnaire survey findings were investigated using Pearson product-moment correlation coefficient against six null hypothesis. The findings showed that there were valuable positive correlation between *sangeetham*, devotional reliance, God, brain and spiritualism. This finding indicates that

devotional *sangeetham* strongly influences the spiritual experience of the Indians. The six Null Hypotheses will be contested by the findings of the six alternative hypotheses in the next chapter.

It can be seen that the demographic and the statistical findings will help to uncover and clarify the social, scientific and philosophical knowledge of the society on Swami Tyagaya, *sangeetham*, Brain, devotion, spirituality and God. The findings will clarify the pattern and nature of devotion and identify the long environmental influence that perhaps creates the state of relaxation of the brain to visualize 'God'. The subjective Survey findings are statistically significant to arrive at a favourable conclusion and prove that the study is properly substantiated. The next chapter will prove and discus the findings for the study.

4.4 FINDINGS OF EEG EXPERIMENTS

4.4.1 Introduction, Candidates and the EEG Test (Tables 40 to 54)

Introduction

The researcher briefly recapitulates the electroencephalographic (EEG) experiment and the method of developing the findings. The study leads to a practical system for non-invasive assessment of the emotional states in devotional singing applications and therefore, observes brain changes associated with long-term devotional meditative singing and spiritual perception. This kind of study has not been systematically explored through the EEG. It is a quantitative objective analysis looking for changes in Neurological parameters of 12 volunteers listening to Devotional *sangeetham* of Swami Tyagaya. These twelve EEG findings of

Group A are compared with the findings of 22 other volunteers of Group B and Group C, who are control group and listening to devotional songs (not Swami Tyagaya's *sangeetham*).

The EEG study will investigate the brain activity during *sangeetham* listening for God realization by measuring the frequency and amplitude in the frontal (F3-F4), central (C3-C4), parietal (P3–P4), and occipital (O1-O2) electrode placements using the International 10 - 20 system EEG. The complete EEG findings will be reported as Alpha, Beta Theta and Delta signals.

i). Alpha brain wave signals are brain waves that cycle within the range of 8 – 12 Hz and usually the amplitude is high ranging from 50 to 100mv. Alpha waves are usually generated in the brains right hemisphere or in a synchronized pattern between both right and left hemispheres. Alpha activity is centred principally in the occipital cortex or the posterior regions of head. Alpha findings denote meditational state and relaxed brainwave activity. (Electroencephalography & Essentials of Neurology; Lord Watson; Churchill Livingstone; London, 1989: 17-31)

ii) Beta brainwave signals are brainwaves within the range of 12 – 30 Hz with a low amplitude of 25 mv and are usually generated in the brain's left-hemisphere and more of Frontal cortex activity. These waves are linked to high cortical frequency and low amplitude. Beta findings denote alertness, active thinking and energetic mental activity. (Essentials of Neurology; Lord Watson; Churchill Livingstone; London, 1989: 17-31)

iii) Theta brainwaves have a predominant frequency of between 4 and 7Hz, and relatively slow frequency cycles per second and high amplitude of 50uv to 100mv. The Theta activity are usually generated in the central cortex. Theta waves have relatively high amplitude compared to the faster alpha and beta brainwaves. This Theta activity is centred in the central lobe in older children. It tends to appear during meditative, drowsy, or sleeping states. Cortical theta is observed frequently in young people. (Wikipedia.org./ Electroencephalography &Essentials of Neurology; Lord Watson; Churchill Livingstone; London, 1989: 17-31)

iv) Delta brainwave is a high amplitude brain wave with a frequency of oscillation between 0–4 hertz. Delta brainwaves are the lowest in brainwave frequency. These waves are linked to high cortical activity. Delta brainwaves are generated in the right hemisphere, though they may be observed in widespread patterns throughout various parts of the brain. Delta brainwaves are considered the most relaxing brainwave frequency range. Delta-brainwaves are commonly associated with the deepest sleep of stages 3 & 4 and a state of unconscious awareness. The delta brainwave range is associated with deep meditation, empathy, the unconscious mind, and a decreased sense of awareness. Delta wave activity is marked, in most young people. (Essentials of Neurology; Lord Watson; Churchill Livingstone; London, 1989: 17-31)

The brain electrical activity is displayed as lines on a graph paper. Each electrode represents an area of the head. The cerebral signals produced as waveforms on the EEG graphs are in the range of 1 to 30Hertz. The brain state is monitored by reading the graph. Obviously, a specifically trained personal is necessary to read and interpret the EEG. The waveforms are divided accordingly as Alpha, Beta Theta and Delta and their characteristics are co-related with the volunteer's brain condition and background.

The findings of this EEG waveforms will explore the correlation of Divine emotions during devotional music listening or singing of Swami Tyagaya's Carnatic *sangeetham*. Also, the findings of the background study of the 34 volunteers will assist in the emotional status correlation. Principal component analysis (PCA) is used to correlate EEG features with complex music appreciation. The study reports the essential positive findings of the EEG electrical signals on the first group (Group A) of devotional *sangeetham* volunteers. The findings are compared with the EEG findings of two other randomized control groups (Group B & Group C). The findings will be correlated with the underlying changes in the biological processes that are associated with the mental response to meditational and Tyagaya's devotional singing.

Group A, B & C and the EEG Test

This study applies EEG algorithms on Group A of 12 devotees to demonstrate the feasibility of devotional Tyagaya's *sangeetham* like meditation is the attainment of a restful yet fully alert physical and mental state practiced

by many as a self-regulatory approach to emotion management and God realization against another 2 control groups of 12 +10 of volunteers who are also mentally occupied with devotional songs. 34 volunteers were recruited as part of an ongoing study of the brain using the International 10 – 20 System, EEG.

The findings intend to evaluate EEG changes in 3 groups of recruits (34 volunteers)

Group A - The pilot group of 12 volunteers (Adult, religious musicians, singinging Tyagaya devotional *sangeetham*) – 35.3%

Group B - The control groups of 12 volunteers (students, partially religious, listening to non Tyagaya devotional songs) – 35.3%

Group C - The control groups Group C of 10 volunteers (adults, teachers, religious, listening to Non Tyagaya devotional songs) – 29.4%.

Table 40: EEG Test Volunteers

Group	**Number of Volunteers**	**%**	**Remarks**
Group A - Adults (Tyagaya Sangeetham)	12	35.3	Pilot Group
Group B - Students (Devotional Songs)	12	35.3	Control Group
Group C - Adults (Devotional Songs)	10	29.4	Control Group
Total	34	100%	

This study will lead to a practical system for non-invasive assessment of the emotional states in Devotional singing applications and therefore, observe brain changes associated with long-term devotional meditative singing and spiritual perception and normal stage.

Procedure

In Group A B and C of 34 volunteers were measured for brain electrical activity. EEG1 at Statum and EEG2 immediately after 15minutes (after listening to Tyagaya or devotional songs) and EEG3 after 15 minutes of rest. 5 minutes later, the last, 4th EEG is taken. The investigation will be conducted with the volunteers eyes closed or blind-folded for the 1st, 2nd & 3rd EEGs and the last 4th EEG with Eyes open.

Table 41: EEG Procedure

Group A B C	Listening to songs	Group A B C	Rest	Group A B C	Rest	Group A B C
EEG 1 statum 2 minutes with eyes clossed	15 minutes Tyagaya or devotional songs with eyes closed	EEG 2 2 minutes with eyes closed	15 minutes with eyes open	EEG 3 2 minutes with eyes open	5 minutes with eyes open	EEG 4 2 minutes with eyes open

4.4.2 Findings of EEG signals in Group A, B, & C

The finding of the EEG investigation will explore the correlation of the divine emotion in the three groups of volunteers.

4.4.2.1 Group A - Findings (Tyagaya devotional *sangeetham*)

The Group A is the pilot group for the EEG experiment. The 12 volunteers are subjected to the devotional *sangeetham* of Swami Tyagaya. The 12 Group A volunteers have an average age of 55 years old and they are all musicians, meditators and religious practitioners of more than 40 years experience. The complete EEG findings are reported as Alpha, Beta Theta and

Delta brain signals respectively. The four stage EEG 1, 2, 3 & 4 findings and the frequency and amplitude and the percentage are shown below. The EEG 2 & 3 are important stages where the 12 volunteers are already subjected to more than 15 minutes of Swami Tyagaya's Devotional *sangeetham*.

Table 42: Group A – Adults 12 (Tyagaya devotional *sangeetham)*

	Alpha V – Cps - Mv		**Beta V – Cps - Mv**		**Theta V – Cps - Mv**		**Delta V – Cps - Mv**	
EEG 1	12	10c50a	12	18c25a	4	6c50a	0	0
EEG 2	12	11c70a	12	18c25a	10	7c50a	3	4c50a
EEG 3	12	11c50a	11	18c25a	10	7c50a	4	4c50a
EEG 4	12	9c50	12	16c25a	9	6c50a	2	3c50a

(V= Number of volunteers, Cps-cycles/second-Hz, Mv = Amplitude)

i) Findings of Alpha waves

The Four stage (EEG 1, 2, 3 & 4) findings, the frequency and amplitude are shown below.

EEG1 - 12 volunteers have average waveform of 10 cps and amplitude of 50uv

EEG2 - 12 volunteers have average waveform of 11 cps and amplitude of 70uv

EEG3 - 12 volunteers have average waveform of 11 cps and amplitude of 50uv

EEG4 - 12 volunteers have average waveform of 9 cps and amplitude of 50uv

The volunteers are represented in percentage and the frequency is represented as an average cps or Herz and amplitude is represented as an average Mv (microvolt). In EEG 1, 2, 3 & 4 Alpha activity is noticed in 100% of the volunteers with an average frequency of 10.25cps. In EEG 2 & 3 Alpha activity

is noticed in 100% of the volunteers with an average frequency of 11cps (EEG 2 &3 is an important stage where the 12 volunteers were already subjected to Swami Tyagaya's Devotional *sangeetham*). There is increase of alpha amplitude ranging from 50mv to 70mv and the alpha frequency is between 9hz to 11 hz. In this group there is a predominance of Alpha activity. Alpha findings denote meditational state and relaxed brainwave activity. The important findings are that the Alpha waves are consistently seen. The alpha activity predominantly originates from the occipital lobe. Alpha brainwaves are considered the healthiest brainwave range and 10 Hz has widely been accepted as the "safest" brainwave frequency. Occipital alpha waves during periods of eyes closed are the strongest EEG brain signals. The 12 group A volunteers are adults and listening to Swami Tyagaya's devotional songs are awake and resting with eyes closed and meditating. Alpha waves are found when the mind and body are completely relaxed and free of stress. Alpha findings denote meditational state and relaxed brain wave activity in the visual cortex..

ii) Findings of Beta waves

The Four stage EEG findings and the two stage EEG findings, the frequency, amplitude and the percentage are shown below.

EEG1 - 12 volunteers have average waveform of 18 cps and amplitude of 25uv
EEG2 - 12 volunteers have average waveform of 18 cps and amplitude of 25uv
EEG3 - 11 volunteers have average waveform of 18 cps and amplitude of 25uv
EEG4 - 12 volunteers have average waveform of 16 cps and amplitude of 25uv

The volunteers are represented in percentage and the frequency represented as an average cps or Herz and amplitude is represented as an average Mv (microvolt). In EEG 1, 2, 3 & 4 Beta activity is noticed in 98% of the volunteers with an average frequency of 17.5cps. In EEG 2 & 3 Beta activity is noticed in 96% of the volunteers with an average frequency of 18cps. Beta waves are consistently seen in the full course of the recording. The Beta amplitude is 25 mv and the Beta frequency is between 16 hz to 18 hz. Beta activity is associated with active thinking and active concentration.

iii) Findings of Theta waves

The Four stage EEG findings and the frequency, amplitude and the percentage are shown below.

EEG1 - 4 volunteers have average waveform of 6 cps and amplitude of 50uv
EEG2 - 10 volunteers have average waveform of 7 cps and amplitude of 50uv
EEG3 - 10 volunteers have average waveform of 7 cps and amplitude of 50uv
EEG4 - 9 volunteers have average waveform of 6 cps and amplitude of 50uv

The volunteers are represented in percentage and the frequency represented as an average cps or Herz and amplitude is represented as an average Mv (microvolt). In EEG 1, 2, 3 & 4 Theta activity was noticed in 68.75% of the volunteers with an average frequency of 6.5cps. Theta activity was noticed in 83% in EEG 2 &3 of the volunteers with an average frequency of 7cps. (EEG 2 & 3 is an important stage where the 12 volunteers were already subjected to Swami Tyagaya's Devotional *sangeetham*). The Theta wave activity is

consistently seen throughout the four stages in the full course of the recording. The amplitude is 50 mv and the Theta frequency is between 6 hz to 7 hz. The important findings is that in EEG 2, 3 & 4, there were 10,10,9 volunteers respectively who registered theta waves after concentrating on Tyagaya's devotional *sangeetham* which indicates slowing of brain activity. 69% volunteers consistently registered Theta activity in EEG 1, 2, 3 & 4. In this group there is a predominance of theta activity. The devotional state after listening to Tyagaya's *sangeetham* probably is the cause for more Theta brainwaves. Theta findings denote feelings of deep relaxation, devotional wellbeing and creative insight, as well as meditational experience or sleeping states. The important findings in this group is that all the volunteers were senior musicians and religious adults and their devotional emotions are heightened and linked with deep states of both physical and mental relaxation and in deep meditation. The Theta wave creation is linked with a feelings of deep relaxation, devotional wellbeing altered states of consciousness.

iv) Findings of Delta waves

The Four stage EEG findings and the two stage EEG findings, the frequency, amplitude and the percentage are shown below.

EEG1 - 0 volunteers have average waveform of 0 cps and amplitude of 0 uv

EEG2 - 3 volunteers have average waveform of 4 cps and amplitude of 50uv

EEG3 - 4 volunteers have average waveform of 4 cps and amplitude of 50uv

EEG4 - 2 volunteers have average waveform of 3 cps and amplitude of 50uv

The volunteers are represented in percentage and the frequency represented as an average cps or Herz and amplitude is represented as an average Mv (microvolt). In EEG 1, 2, 3 & 4 Delta activity was noticed in 18.75% of the volunteers with an average frequency of 2.75 cps. In EEG 2 & 3 Delta activity was noticed in 29% of the volunteers with an average frequency of 4cps. Delta waves are inconsistently seen in the recording. The amplitude is of 50 mv and the delta frequencies are between 3 hz to 4 hz. In this group there is less dominance of delta activity. The important finding is that only 9 volunteers showed delta activity which denotes deep meditative state. The devotional state after listening to Swami Tyagaya's kritis probably was the cause for delta brainwaves. Delta brainwave states usually occur in deep meditation, deep sleep and deep relaxation. Infants and young children tend to have extremely high levels of theta and delta brainwaves compared to adults.

v) Background Statistics Findings of group A

The background occupational and emotional states of the 12 volunteers will assist in the association with long-term Tyagaya's devotional singing and spiritual perception and therefore the findings will assist in the observation of the EEG brain signals.

Table 43: Background statistics of group A

Age	Gender	Religion	Education	Town	Sing (years)	Pray (years)	Read (years)	Fast (yeas)	Service (years)	Religious Sstudy (yeas)	Activities (years)	Question 1	Question 2	Question 3	Question 4
67	F	H	T	KL	45	60	50	25	40	3 5	40	1	1	1	1
54	F	H	T	KL	52	50	20	20	30	21	0	1	1	1	1
29	F	H	T	KL	25	25	20	5	4	25	0	1	1	1	1
59	F	H	T	KL	42	52	30	30	40	25	0	1	1	1	1
44	F	H	T	KL	30	25	35	20	12	30	0	1	1	1	1
42	F	H	T	KL	13	8	13	2	0	17	13	1	1	1	1
83	M	H	T	KL	40	40	0	0	25	30	35	1	1	1	1
46	M	H	T	KL	40	40	0	0	25	30	35	1	1	1	1
45	F	H	T	KL	40	40	30	20	20	40	0	1	1	1	1
57	F	H	T	KL	10	20	18	20	18	12	0	1	1	1	1
58	F	H	T	SA	50	35	10	20	30	20	10	1	1	1	1
75	F	H	T	SA	70	60	50	20	20	20	0	1	1	1	1

(F = female, M = Male, H = Hindu, T = Tertiory, KL = Kuala Lumpur, SA = Shah Alam)

vi) Background findings of Group A

The 12 Group A volunteers were educated and religious people. They were *sangeetham* teachers and professionals with knowledge of Swami Tyagaya's *sangeetham*. The average age was 55 years old. There were 10 females and 2 males. They were all Hindus. They were all from and around Kuala Lumpur. The average years they practised Singing Tyagaya's *kriti*s was 38 years, praying 38 years, reading Hindu scriptures 23, fasting 15 years, social service 22 and religious study 25 years.

Four questions were asked which were related to the volunteers' perception of God after listening to Saint Tyagaya's *sangeetham*.

Question 1 - Does singing devotional music give you happiness?

Question 2 - Does that happiness lead you to 'God sensation'?

Question 3 - Does your religious practice lead you to God?

Question 4 - Do you belief that the brain has a 'God centre'?

All the 12 volunteers answered overwhelmingly positive which denoted 100%. The subjective finding is that all the 12 volunteers were emotional and described their experience as a divine emotion**.** The finding proved valuable for the meditative nature of this group and for the association of EEG experimentation.

Conclusion: Findings of Group A.

The findings points out that Swami Tyagaya's *sangeetham* creates relaxed brain activity due to the presence of high percentage of Alpha and Theta signals. They are correlated with a generally tranquil, pleasant, almost floating feeling and associated with relaxed wakefulness, and creative thought. It is a brain waves of contemplation. It is considered as an integral part of the relaxation process before sleep. The dominant Alpha and Theta waves are associated extensively in meditation. Also the The background findings were overwhelmingly encouraging showing that the volunteers had good knowledge of Swami Tyagaya's *sangeetham* and all of them were deeply religious and were musicians.

Alpha activity is noticed in 100% of the volunteers in Group A in EEG 1, 2, 3 & 4. EEG 2 &3 stage also recorded 100% with Alpha activity. Theta activity was noticed in 68.75% of the volunteers in Group A in EEG 1, 2, 3 & 4 stage. EEG 2 &3 recorded 83% with theta activity. Delta activity was noticed in 18.75% of the

volunteers in Group A in EEG 1, 2, 3 & 4. Stage EEG 2 & 3 recorded 29% with delta activity. Beta activity was noticed in 95.75% of the volunteers in Group A in EEG 1, 2, 3 & 4. Stage EEG 2 & 3 recorded 96% with Beta activity.

The EEG findings pointed that Swami Tyagaya's Devotional *Sangeetham* registered a superlative correlation to the devotional emotions which have heightened and linked with deep states of both physical and mental relaxation. The subjective background findings and the objective EEG findings support the study.

4.4.3 Group B – Findings (Devotional songs)

The Group B volunteers is the control group for the EEG experiment. The 12 volunteers were subjected to the Devotional songs of their choice (Not Saint Tyagaya's *sangeetham*). They are all about 20 years of age and they are all university students. They have moderate interest in religion and devotional songs but no knowledge of saint Tyagaya's *sangeetham*.

The complete EEG findings are in Alpha, Beta Theta and Delta signals respectively. The Four stage EEG findings and the frequency and amplitude and the percentage are shown below. The EEG 2 &3 are important stages where the 12 volunteers were already subjected to more than 15 minutes of Devotional songs.

Table 44: Group A – Students 12 - Devotional songs (Non Tyagaya)

	Alpha V – Cps - Mv		**Beta V – Cps - Mv**		**Theta V – Cps - Mv**		**Delta V – Cps - Mv**	
EEG 1	12	10c50a	9	15c25a	2	7c50a	2	3c50a
EEG 2	10	10c50a	11	17c25a	8	7c50a	3	3c50a
EEG 3	11	10c50a	11	16c25a	5	7c50a	5	3c50a
EEG 4	10	10c50a	12	15c25a	6	6c50a	4	4c50a

(V= Number of volunteers, Cps-cycles/second-Hz, Mv = Amplitude)

i) Findings of Alpha waves

The Four stage (EEG 1, 2, 3 & 4) findings, the frequency and amplitude are shown below.

EEG1 - 12 volunteers have average waveform of 10 cps and amplitude of 50uv

EEG2 - 10 volunteers have average waveform of 10 cps and amplitude of 70uv

EEG3 - 11 volunteers have average waveform of 10 cps and amplitude of 70uv

EEG4 - 10 volunteers have average waveform of 10 cps and amplitude of 50uv

The volunteers are represented in percentage and the frequency represented as an average cps and amplitude is represented as an average Mv. In EEG 1, 2, 3 & 4 Alpha activity was noticed in 89.5% of the volunteers with an average frequency of 10 cps. In EEG 2 & 3 Alpha activity was noticed in 87.5% % of the volunteers with an average frequency of 10cps. In this Group B there is a majority of Alpha activity with amplitude ranging from 50mv to 70mv. The alpha frequency were averaging at 10 hz. Usually Alpha brainwaves are considered as the “safest”

brainwave frequency and students tend to have much higher levels of alpha brainwaves than adults. Alpha findings denote meditational state and relaxed brainwave activity and when the mind and body are completely relaxed and free of stress.

ii) Findings of Beta waves

The Four stage (EEG 1, 2, 3 & 4) findings, the frequency and amplitude are shown below.

EEG1 - 9 volunteers have average waveform of 15 cps and amplitude of 25uv
EEG2 - 11 volunteers have average waveform of 17 cps and amplitude of 25uv
EEG3 - 11 volunteers have average waveform of 16 cps and amplitude of 25uv
EEG4 - 12 volunteers have average waveform of 15 cps and amplitude of 25uv

The volunteers are represented in percentage and the frequency represented as an average cps and amplitude is represented as an average Mv. In EEG 1, 2, 3 & 4 Beta activity was noticed in 89.75% of the volunteers with an average frequency of 15.75cps. In EEG 2 & 3 Beta activity was noticed in 92% of the volunteers with an average frequency of 16.5cps. Beta waves are consistently seen in all leads. In the full course of the recording there were decrease of Beta amplitude of 25 mv and the Beta frequency were between 15 hz to 17 hz. In this group there is a predominance of Beta activity. Usually, Beta findings denote alertness, active thinking and energetic mental activity.

iii) Findings of Theta waves

The Four stage (EEG 1, 2, 3 & 4) findings, the frequency and amplitude are shown below.

EEG1 - 2 volunteers have average waveform of 7 cps and amplitude of 50uv
EEG2 - 8 volunteers have average waveform of 7 cps and amplitude of 50uv
EEG3 - 5 volunteers have average waveform of 7 cps and amplitude of 50uv
EEG4 - 6 volunteers have average waveform of 6 cps and amplitude of 50uv

The volunteers are represented in percentage and the frequency represented as an average cps and amplitude is represented as an average Mv. In EEG 1, 2, 3 & 4 Theta signals were noticed in 43.5% of the volunteers with an average frequency of 6.75cps. In EEG 2 & 3 Theta signals were noticed in 53.5% of the volunteers with an average frequency of 7cps. In this group there is a smaller amount of Theta activity. Theta waves are consistently seen in all leads. In the full course of the recording there were consistent amplitude of 50 mv. The Theta frequency are between 6 hz to 7 hz. Theta findings denote feelings of deep relaxation, devotional wellbeing and creative insight, as well as meditational experience. Theta waves tends to appear during drowsy, or sleeping states or to the devotional state after listening to devotional songs.

The findings are that in EEG 2, 3 & 4 there were 8,5,6 volunteers respectively who registered theta waves after concentrating on devotional music which indicates slowing of brain activity. It tends to appear during meditative, drowsy, or sleeping states. All the volunteers in this group were students.

iv) Findings of Delta waves

The Four stage (EEG 1, 2, 3 & 4) findings, the frequency and amplitude are shown below.

EEG1 - 2 volunteers have average waveform of 3 cps and amplitude of 50uv

EEG2 - 3 volunteers have average waveform of 3 cps and amplitude of 50uv

EEG3 - 5 volunteers have average waveform of 3 cps and amplitude of 50uv

EEG4 - 4 volunteers have average waveform of 4 cps and amplitude of 50uv

The volunteers are represented in percentage and the frequency represented as an average cps and amplitude is represented as an average Mv. In EEG 1, 2, 3 & 4 Delta activity was noticed in 29% of the volunteers with an average frequency of 3.25cps. In EEG 2 & 3 Delta activity was noticed in 33% of the volunteers with an average frequency of 3cps. In this group there is less dominance of delta activity. Delta waves are inconsistently seen. In the full course of the recording there was the amplitude of 50 mv and the delta frequencies were between 3 hz to 4 hz. The important finding is that only 14 volunteers showed delta activity which denotes deep meditative state. The devotional state after listening to devotional *kriti*s probably was the cause for delta brainwaves. Delta brainwave states usually occur in deep sleep and deep relaxation. Infants and young children tend to have extremely high levels of theta and delta brainwaves compared to adults.

v) Background Statistics Findings of group B

The background occupational and emotional states of the volunteers will assist in the association with Devotional singing and spiritual perception. The findings will assist in the observation of the EEG brain signals.

Table 45: Background statistics of group B

Age	Gender	Religion	Education	Town	Sing (years)	Pray (years)	Read (years)	Fast (yeas)	Service (years)	Religious Sstudy (yeas)	Activities (years)	Question 1	Question 2	Question 3	Question 4
21	M	H	S	JB	5	20	15	1	10	1 6	0	1	0	1	0
21	M	H	S	J	8	20	16	4	4	1 6	0	1	0	1	0
21	M	H	S	J	7	16	10	3	5	14	0	1	0	1	0
21	M	C	S	J	10	21	10	5	3	15	0	0	0	1	0
20	F	H	S	PD	10	10	8	7	1	15	0	1	0	1	0
22	F	H	S	KL	13	8	13	2	0	17	0	1	0	1	0
21	F	H	S	SR	10	15	15	15	15	15	0	1	0	1	0
20	F	H	S	M	10	10	15	10	15	10	0	1	0	1	0
20	M	H	S	PJ	0	6	0	4	0	14	0	1	1	1	0
19	M	H	S	PJ	0	14	0	0	0	14	0	1	1	1	0
20	M	C	S	PJ	0	12	12	0	0	14	0	1	0	1	0
20	M	H	S	C	0	12	12	0	0	14	0	1	1	1	0

(F = female, M = Male, H = Hindu, S = Student, JB = Johor Baharu, PD = Port Dickson, KL = Kuala Lumpur, SR = Seremban, M = Malacca, PJ = Petaling Jaya, C = Cheras)

Background findings of Group B.

The background findings of the 12 group B volunteers. The average age was 20 years old. There were 4 females and 8 males. They were 12 Hindus. The average years they practiced Singing religious songs was 6 years, reading Hindu scriptures 6 years, praying 14 years, fasting 4 years, social service 4years and religious study 15 years. Four questions were asked which were related to the volunteers' perception of God after listening to Saint Tyagaya's *sangeetham*.

Question 1 -.Does singing devotional music give you happiness?

Question 2 -.Does that happiness lead you to 'God sensation'?

Question 3 -.Doesyour religious practice lead you to God?

Question 4 -.Do you belief that the brain has a 'God centre'?

The 12 volunteers answered the four questions which denoted 54%.positive. The answers were 26 positive and 22 negative. The findings were the students were not sure of their emotions and did not believe in divine feelings. The finding proved less valuable for the meditative nature of this group

Conclusion: Findings of Group B.

The findings points out that the devotional songs activates the brain into producing Alpha, Beta, Theta and Delta activity. The high percentage of Alpha and Delta signals associate this drowsy stage or tranquil state of rest or a sleep state. The high percentage of Beta signals relates to an active brain.The background findings are that the volunteers are young with a weak correlation to devotional emotions.

Alpha activity (EEG 1, 2, 3 & 4) was noticed in 89.5% and stage EEG 2 & 3 recorded 87.5%. Theta activity (EEG 1, 2, 3 & 4) was noticed in 43.5% and stage EEG 2 & 3 recorded 53.5%. Delta activity (EEG 1, 2, 3 & 4) was noticed in 29% and stage EEG 2 & 3 recorded 33%. Beta activity (EEG 1, 2, 3 & 4) was noticed in 89.75% and stage EEG 2 & 3 recorded 92%.

The EEG signals suggested that devotional music reveal a weak correlation to the devotional emotions but shows state of mental relaxation or sleep state or active

brain. The subjective background findings correlated weakly to the objective EEG findings.

4.4.4 Group C – Findings (Devotional songs)

Group C is another control group. The 10 Group C volunteers are all over 50 years of age and they are all officers and teachers. The 10 Group C volunteers are with sufficient religious experience but no knowledge of saint Tyagaya's *sangeetham*. The 10 volunteers were subjected to the Devotional songs of their choice. (Not Saint Tyagaya's *sangeetham*).

The complete EEG findings are in Alpha, Beta Theta and Delta signals respectively. The Four stage EEG findings and the frequency and amplitude and the percentage are shown below. The EEG 2 & 3 are important stages where the 10 volunteers were already subjected to more than 15 minutes of Devotional songs.

Table 46: Group C – Adults 102 - Devotional songs (Non Tyagaya)

	Alpha V – Cps - Mv		**Beta V – Cps - Mv**		**Theta V – Cps - Mv**		**Delta V – Cps - Mv**	
EEG 1	10	10c50a	9	18c25a	3	6c50a	0	0
EEG 2	10	11c50a	10	18c25a	8	7c50a	1	3c50a
EEG 3	10	10c50a	9	17c25a	7	6c50a	1	3c50a
EEG 4	6	9c50a	10	22c25a	8	7c50a	0	0

(V= Number of volunteers, Cps-cycles/second-Hz, Mv = Amplitude)

i) Findings of Alpha waves

The Four stage (EEG 1, 2, 3 & 4) findings, the frequency and amplitude are shown below.

EEG1 - 10 volunteers have average waveform of 10 cps and amplitude of 50uv

EEG2 - 10 volunteers have average waveform of 11 cps and amplitude of 70uv

EEG3 - 10 volunteers have average waveform of 10 cps and amplitude of 50uv

EEG4 - 6 volunteers have average waveform of 9 cps and amplitude of 50uv

The volunteers are represented in percentage and the frequency represented as an average cps and average amplitude in mv. In EEG 1, 2, 3 & 4 Alpha activity was noticed in 90% of the volunteers with an average frequency of 10cps. In EEG 2 & 3 Alpha activity was noticed in 100% of the volunteers with an average frequency of 10.5cps. The important finding in this group is that there is a predominance of Alpha activity. The alpha frequency was averaging at 10 hz. In the full course of the recording there were increase of alpha amplitude ranging from 50mv to 70mv. The important findings are that the Alpha waves are consistently recorded in all leads. There is increase of Alpha amplitude and decrease of alpha frequency. Alpha brainwaves are considered the healthiest brainwave range and Occipital alpha waves during periods of eyes closed are the strongest EEG brain signals. The alpha activity predominantly originates from the occipital lobe. Usually, Alpha waves are found when the mind and body are completely relaxed and free of stress. Alpha findings denote meditational state and relaxed brainwave activity. The 10 group C volunteers are adults with religious experience and they listen to devotional songs.

ii) Findings of Beta waves

The Four stage (EEG 1, 2, 3 & 4) findings, the frequency and amplitude are shown below.

EEG1 - 9 volunteers have average waveform of 18 cps and amplitude of 25uv
EEG2 - 10 volunteers have average waveform of 18 cps and amplitude of 25uv
EEG3 - 9 volunteers have average waveform of 17 cps and amplitude of 25uv
EEG4 - 10 volunteers have average waveform of 22 cps and amplitude of 25uv

The volunteers are represented in percentage and the frequency represented as an average cps and average amplitude in mv. In EEG1, 2, 3 & 4 Beta activity was noticed in 95% of the volunteers with an average frequency of 18.75cps. In EEG 2 & 3 Beta activity was noticed in 95% of the volunteers with an average frequency of 17.5cps. In this group there is a predominance of Beta activity. Beta waves are consistently seen in all leads. In the full course of the recording there were decrease of Beta amplitude of 25 mv and the beta frequency were between 18 hz to 17 hz. Generally, Beta findings denote alertness, active thinking and energetic mental activity. Beta activity is often associated with active, busy or anxious thinking and active concentration. Beta waves are produced in when logically thinking, feeling stressed, and feeling tense. A large amount of beta activity is possible in alert and thinking brain.

iii) Findings of Theta waves

The Four stage (EEG 1, 2, 3 & 4) findings, the frequency and amplitude are shown below.

EEG1 - 3 volunteers have average waveform of 6 cps and amplitude of 50uv

EEG2 - 8 volunteers have average waveform of 7 cps and amplitude of 50uv

EEG3 - 7 volunteers have average waveform of 6 cps and amplitude of 50uv

EEG4 - 8 volunteers have average waveform of 7 cps and amplitude of 50uv

The volunteers are represented in percentage and the frequency represented as an average cps and average amplitude in mv. In EEG 1, 2, 3 & 4 Theta activity was noticed in 65% of the volunteers with an average frequency of 6.5cps. In EEG 2 & 3 Theta activity was noticed in 75% of the volunteers with an average frequency of 6.5cps. Group C has the second largest finding of theta activity. Theta waves are consistently seen in all leads. In the full course of the recordings there were consistent amplitude of 50 mv. The Theta frequency was between 6 Hz to 7 Hz. The findings are that in EEG 2, 3 & 4 there were 8, 7, 8 volunteers respectively who registered theta waves after concentrating on devotional music which indicates slowing of brain activity. Theta findings denote feelings of deep relaxation, devotional wellbeing and creative insight, as well as meditational experience. The devotional state after listening to devotional songs probably is the cause for more Theta brainwaves. The important findings in many volunteers are that their devotional emotions were heightened and linked with deep states of both physical and mental relaxation. Since most of the volunteers in this group were teachers and professionals, they were in a state of deep meditation. Generally, Theta waves can appear during immobility and sleep (REM). The Theta wave creation is linked with a feelings of deep relaxation, devotional wellbeing altered states of consciousness. Theta waves are associated with feelings of deep peace and calm.

iv) Findings of Delta waves

The Four stage (EEG 1, 2, 3 & 4) findings, the frequency and amplitude are shown below.

EEG1 – No Delta

EEG2 - 1 volunteers have average waveform of 3 cps and amplitude of 50uv

EEG3 - 1 volunteers have average waveform of 3 cps and amplitude of 50uv

EEG4 – No Delta

The volunteers are represented in percentage and the frequency represented as an average cps and average amplitude in mv. In EEG1, 2, 3 & 4 Delta activity was noticed in 5% of the volunteers with an average frequency of 1.5cps. In EEG 2 & 3 Delta activity was noticed in 5% of the volunteers with an average frequency of 3cps. Delta waves are inconsistent and reduced. In the full course of the recording there was amplitude of 50 mv. The delta frequencies were between 3 hz. In this group there is less dominance of delta activity. The important finding is that only 2 volunteers showed delta activity which denotes deep meditative state. The devotional state after listening to devotional kritis probably was the cause for delta brainwaves. Delta brainwave states usually occur in deep sleep, it and deep relaxation. Infants and young children tend to have extremely high levels of theta and delta brainwaves compared to adults. Delta waves are found in some people who practice a type of deep meditation or while in a deep dreamless sleep.

v) Background Statistics Findings of group C

The background occupational and emotional states of the volunteers will assist in the association with devotional singing and spiritual perception. The findings will assist in the observation of the EEG brain signals.

Table 47: Background statistics of group C

Age	Gender	Religion	Education	Town	Sing (years)	Pray (years)	Read (years)	Fast (yeas)	Service (years)	Religious Study (yeas)	Activities (years)	Question 1	Question 2	Question 3	Question 4
64	F	H	S	SA	0	40	40	0	30	1 5	0	1	1	1	1
53	M	H	S	KL	0	45	0	0	20	9	0	1	1	1	1
56	M	H	T	SR	10	50	10	10	20	15	0	1	1	1	1
51	F	H	S	SA	0	40	40	0	30	15	0	1	1	1	1
54	F	H	S	KL	0	40	0	0	10	9	0	1	1	1	1
58	M	H	S	KL	0	26	0	0	20	9	0	1	1	1	1
63	F	H	P	KL	60	0	0	0	0	6	0	1	1	1	1
59	F	H	T	KL	0	10	2	0	10	20	0	2	2	2	2
64	M	H	S	KL	0	60	0	0	30	12	0	1	1	1	1
52	F	H	T	SR	0	20	5	10	10	20	0	1	1	1	1

(F = female, M = Male, H = Hindu, S = Secondary, T = Tertiory, P = Primary, SA = Shah Alam, KL = Kuala Lumpur, SR = Seremban)

Background findings of Group C

The background findings of the 10 group C volunteers. They were educated and religious people. They were teachers and professionals. The average age was 58 years old. There were 6 females and 4 males. They were all Hindus. They were all from and around Kuala Lumpur. The average years they practiced singing religious songs was 7 years, reading Hindu scriptures 10 years, praying 33 years, fasting 2 years, social service 18 years and religious study 13 years. Four questions

were asked which were related to the volunteers' perception of God after listening to Saint Tyagaya's *sangeetham*.

Question 1 - Does singing devotional music give you happiness?
Question 2 - Does that happiness lead you to 'God sensation'?
Question 3 - Does your religious practice lead you to God?
Question 4 - Do you belief that the brain has a 'God centre'?

All the 10 volunteers answered the four questions overwhelmingly positive which denoted 100%. The finding is that all the 100% volunteers were emotional and described their experience as a divine emotion. The finding proved valuable for the meditative nature of this group and the association of EEG experimentation. The finding proved valuable for the meditative nature of this group in the devotional songs.

Conclusion: Findings of Group C

The findings points out that the devotional songs engages the brain into producing more of Alpha, Beta, Theta and Delta activities. The high percentage of Alpha and Theta show that the devotional emotions are heightened and linked with very deep states of both physical and mental relaxation. The background findings of the 10 group C volunteers reveal that they are older age group with good exposure to religious and social activities. The volunteers describe that their devotional experience as an exciting knowledge.

Alpha activity (EEG 1, 2, 3 & 4) was noticed in 90% and stage EEG 2 & 3 recorded 100%. EEG 2 & 3 is an important stage where the 12 volunteers were

already subjected to Devotional *sangeetham*). Theta activity (EEG 1, 2, 3 & 4) was noticed in 65% and stage EEG 2 & 3 recorded 75%. Delta activity (EEG 1, 2, 3 & 4) was noticed in 5% and stage EEG 2 & 3 recorded 5%. Beta activity (EEG 1, 2, 3 & 4) was noticed in 95% and stage EEG 2 & 3 recorded 95%.

These findings suggested a superlative correlation to the devotional emotions of Group C volunteers which have heightened and linked with deep states of both physical and mental relaxation. The subjective background findings correlated strongly to the objective EEG findings.

Table 48: Summary Background statistics of Group A, B &C

	Group A	**Group B**	**Group C**
Sex	10 Female 2 Male	4 Female 8 Male	6 Female 4 Male
Religion	Hindu	Hindu	Hindu
Profession	Musicians, Religious people	Students	Teachers, Professionals
Average Age	55	20	58
Singing	38 years	6	7
Praying	38 years	14	33
Scriptures	23y	6	11
Fasting	15y	4	2
Social service	22y	4	18
Religious study	25y	15	13
% of answer of 4 questions	100%	54%	100%
Overall score	Meditative	Less Meditative	Meditative

The Group A overall background finding is that all the 12 volunteers answered the questions overwhelmingly positive which denoted 100%. The finding is that all the volunteers were emotional and described their experience as a divine emotion**.** The finding proved highly valuable for the meditative nature.

The Group B overall finding is that all the 12 volunteers answered the four questions with 26 positive which denoted 54%.positive. The tentative finding is that the volunteers appeared less emotional probably because they were young. The finding proved less valuable for the meditative nature.

The Group C overall finding is that all the 10 volunteers answered the four questions overwhelmingly positive which denoted 100%. The finding is that all the volunteers were emotional and motivated to sacred experience. The finding proved positively valuable for the meditative nature of this group.

Conclusion

The background finding of Group A indicates a higher percentage of experiential and spiritual knowledge than the other groups. Swami Tyagaya *sangeetham* listeners were predominant than Group B & Group C in their religious experience. Group C volunteers had a better spiritual background than Group B.

4.4.5 Conclusive Summary of the EEG Findings

The findings of the EEG investigation assists in the correlation of Divine emotions during the singing of Swami Tyagaya's Carnatic *sangeetham* and devotional music listening. A person, who is in meditation, can have any mental experience related to Alpha, Beta, Theta or Delta brainwaves and from the brain signals very interesting corollary have been drawn. Meditation as a result of the devotional *sangeetham* creates a relaxed state of mind which corresponds to a particular signal. On a brainwave level the relaxed state reaches an Alpha state of consciousness and as the meditation deepens there is more calm and the brainwave levels reaches the Theta state and as the meditation deepens still further and finally to the Delta state which is unconsciousness state .

The overall EEG signals reported under Group A shows the mental state as a result of Tyagaya's devotional *sangeetham* and the brain. The overall EEG finding reported under Group B &C will show the different electrical signal patterns from the brain as evidences on the values of devotional songs and the brain. (not Tyagaya's *sangeetham*). The Principal component analysis (PCA) is used to correlate EEG features with complex music appreciation to evaluate the EEG signals.

In order to understand the EEG signals, the findings are divided in three parts A, B & C with Tables 49 to 54 for easy reference. The findings show the individual Percentage of Alpha, Beta, Theta and Delta Waves.

4.4.5.1 The Individual Test – Alpha waves (Table 49)

Test	**Group A (12 volunteers) Adults – Tyagaya Devotional *Sangeetham***		**Group B (12 volunteers) Students - Non Tyagaya Devotional**		**Group C (10 volunteers) Adults - Non Tyagaya Devotional**	
	Number	%	Number	%	Number	%
Test 1	12	100	12	100	10	100
Test 2	12	100	10	83	10	100
Test 3	12	100	11	92	10	100
Test 4	12	100	10	83	6	60

4.4.5.2 The Individual Test – Beta waves (Table 50)

Test	**Group A (12 volunteers) Adults – Tyagaya Devotional *Sangeetham***		**Group B (12 volunteers) Students - Non Tyagaya Devotional**		**Group C (10 volunteers) Adults - Non Tyagaya Devotional**	
	Number	%	Number	%	Number	%
Test 1	12	100	9	75	9	90
Test 2	12	100	11	92	10	100
Test 3	11	92	11	92	9	90
Test 4	12	100	12	100	10	100

4.4.5.3 The Individual Test – Theta waves (Table 51)

Test	**Group A (12 volunteers) Adults – Tyagaya Devotional *Sangeetham***		**Group B (12 volunteers) Students - Non Tyagaya Devotional**		**Group C (10 volunteers) Adults - Non Tyagaya Devotional**	
	Number	%	Number	%	Number	%
Test 1	4	33	2	17	3	30
Test 2	10	83	8	66	8	80
Test 3	10	83	5	41	7	70
Test 4	9	75	6	50	8	80

4.4.5.4 The Individual Test – Delta waves (Table 52)

Test	**Group A (12 volunteers) Adults – Tyagaya Devotional *Sangeetham***		**Group B (12 volunteers) Students - Non Tyagaya Devotional**		**Group C (10 volunteers) Adults - Non Tyagaya Devotional**	
	Number	%	Number	%	Number	%
Test 1	0	0	2	17	0	0
Test 2	3	25	3	25	1	10
Test 3	4	33	5	41	0	0
Test 4	2	17	4	33	1	10

The findings show the individual recordings of the different areas of the brain's electrical activity over a period of time. According to the individual test, the Group A denotes a higher percentage of Alpha, Beta, Theta and Delta waves. The Group B shows a higher level of Theta, Beta and Delta waves. The Group C shows high levels of Alpha, Beta and Theta waves.

4.4.5.5 Conclusive Summary of EEG 1 2 3 & 4

The EEG finding of stage 1, 2, 3 & 4 reported will show the different electrical signal patterns from the brain after from the start to the end of 45 minutes of concentration of Tyagaya's Devotional *sangeetham* for Group A and devotional songs for Group B & C respectively.

Table 53: Summary of Group A, B & C for EEG 1 2 3 & 4

	Alpha (%)	**Beta (%)**	**Theta (%)**	**Delta (%)**
Group A	100	96	69	19
Group B	89.5	90	43.5	29
Group C	90	95	65	5

4.4.5.6 Conclusive Summary of EEG 2 & 3

The EEG finding of stages 2 & 3 reported will show the different electrical signal patterns from the brain after 15minutes and 30 minutes of concentration of Tyagaya's Devotional *sangeetham* for Group A and devotional song for Group B & C respectively.

Table 54: Summary of Group A, B & C for EEG 2 & 3

	Alpha (%)	**Beta (%)**	**Theta (%)**	**Delta (%)**
Group A	100	96	83	29
Group B	89.5	92	53.5	3
Group C	100	95	75	5

The findings show the recordings of the different areas of the brain's electrical activity over a period of time as Alpha, Beta, Theta and Delta wave patterns. The Group A, B & C findings will pronounce significant information of the activity of the brain during the influence of Swami Tyagaya's *sangeetham* and devotional meditative *sangeetham*. The findings of the Volunteers' background will further help to substantiate the devotional and experiential values of the Groups.

The comparison of the three group findings will clarify the pattern and nature of devotion and identify the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God". The EEG signals are scientifically significant to arrive at a favourable conclusion and prove that the thesis is properly substantiated.

4.5 The Conclusion of Questionnaire survey and EEG Experiment.

In conclusion this chapter has reported several statistics findings of the Questionnaire survey and the results of the EEG experiments. The specific statistical findings have reported a number of critical demographic information. The Questionnaire survey findings were investigated using Pearson product-moment correlation coefficient against six null hypotheses. The findings and the positive correlations between *sangeetham*, devotional reliance, God, brain and spiritual feelings among the Indians are statistically reported. The six Nul hypothesis will be contested by the six alternative hypotheses during discussion in the next chapter.

The findings of the EEG electrical signals of Alpha, Beta, Theta and Delta of Group A,B & C are reported in detail in Tables 42 to Tables 54 and the findings of the background of the EEG volunteers will assist to substantiate the overall findings of the brainwave signals. The statistical significance of the EEG signals of Groups A, B & C are correlated towards Swami Tyagaya's *sangeetham* versus devotional songs.

The findings of both the survey and the EEG will closely associate to prove the objective of the study. The demographic findings and the survey findings will facilitate to uncover and clarify the social, philosophical and scientific knowledge of Swami Tyagaya, *Sangeetham*, Brain, Devotion, Spirituality and God. The EEG findings will clarify the nature of devotion al *sangeetham* and identify

the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God". The subjective Survey findings are statistically significant and the objective EEG findings are scientifically significant and they will assist to arrive at a favourable conclusion and prove that the research is properly substantiated.

CHAPTER FIVE

DISCUSSION AND CRITICAL ANALYSIS OF THE RESEARCH FINDINGS

5.1 . INTRODUCTION

This chapter critically discusses the findings, generates conclusion and creates recommendation based on the findings of the literature evaluation, questionnaire survey and the outcome of the EEG experiments. The analyses is based on the specific statistical findings provided by the questionnaire survey in response to the rating scales and the discussion is based on the neuro-psychological findings provided by the EEG signals. The discussion implicates the validity of the empirical study and identifies significant links between Carnatic *sangeetham*, Swami Tyagaya, brain, God, spirituality and the welfare of the society. The inference of the discussion is based on the survey and the EEG results which will specify the goodness of devotional *sangeetham* towards mental and physical health and will show how it will influence the society towards love, tolerance and compassion.

A national Questionnaire survey was conducted to assess mainly the knowledge of Swami Tyagaya's *sangeetham*, God, neuropsychology and spirituality. The questionnaire survey findings are based on the Statistical Package for the Social Sciences (SPSS 22) software system for statistical analysis. Multiple composite indexes are created to assess *Sangeetham*, Swami Tyagaya, neuro-psychology, spiritual faith and meditation across age, race, gender, education, income denomination, family status and spiritual health status. The survey findings show the public perception on devotional *sangeetham*, meditation, brain, God and spirituality.

The EEG discussion is based on the findings of the experiments conducted on the brain of selected volunteers. The brain activity is associated with the astablished signals. Eventually, the conclusion is based on the correlation of the survey and the EEG experimentations.

The present discussion aims to establish the potential of Swami Tyagaya's devotional *sangeetham* in the society and how it plays a prominent role in the emotional centres of the brain and how it creates a visual imagery of 'God'. The summary of the findings of the Questionnaire survey from the local society determines their knowledge on Swami Tyagaya's *sangeetham*, devotion, meditation, God and spirituality and the EEG findings of volunteers establishes salient Neuro-Psychology answers. The survey outcome and the EEG results are compared with Dr Newberg, Dr Sundrachari and Dr Kasamatsmu research materials.

This introduction recapitulates the rationale and objective of the current study, the research questions, the research design, the methodology, the limitations of the study and the findings The discussion will dealt in this current chapter. The conclusion and recommendation will be dealt in next chapter. The study attempts to substantiates the rationale by demonstrating that Swami Tyagaya's spiritual *sangeetham* plays a prominent role in the brain and creates the visual imagery of God. It also studies how modern Neuro-Psychology approves this "God- Image " in the brain?

5.2 THE SCRUTINIZED RESEARCH QUESTIONS

The research questions of the study is intended to examine a new line of theory and how it relates to existing theories and it examines the evidences. The study demonstrates what that new theory is and why the new theory is needed and the intended scope of its application. Therefore, the study examines relevant questions like how does Tyagaya's devotional compositions construct in the mind and explains the dynamics of the brain centres? The study justifies how Tyagaya's devotional *sangeetham* teaches about the realization of Brahmam, (God) and how science reveals about the effects of meditational music in the brain? How and why did Swami Tyagaya have religious experiences? Is it purely inexplicable emotional outburst or neurological or psychological disorders? Is there truly sensory centres specialized in recognizing emotional or Spiritual (Godly) subjects in the brain? Can these issues be proved on empirical grounds? What is the status of modern Neuro-Psychology here? What are the salient neurological pathways and what are the scientific experiments to corroborate *sangeetham*'s spiritual encounters? How does the musical spirit of Tyagopanishad as a spiritual practice create compassion and suppress anger and violence in the modern society? Does practicing devotional *sangeetham* activate faith, compassion, love and tolerance?

The research questions relates to the objective of the study by examining and demonstrating that Swami Tyagaya's devotional *sangeetham* plays a prominent role in the emotional centres of the brain and create a visual imagery of 'God' and establishs through the survey that the present society is sensitivity to Swami Tyagaya's *sangeetham*, brain, devotional, spirituality and God. The motive of the

EEG is to learn how modern Neuro-Psychology illustrates this "God- Image" in the brain. and thus validate the spiritual status of the society.

5.3 RESEARCH DESIGN AND METHODOLOGY EMPLOYED

The present study has relied largely on qualitative and quantitative methodology for data collection. In the qualitative methodology, the current review of literature were designed to test the hypothesis that the meditative *Sangeetham* of Swami Tyagaya could produce an unique spiritual response in the brain. The Two quantitative methodologies were used to a wider extent. The first in the form of subjective questionnaire survey and the second in the form of an empirical EEG experiments.

This study is researched with three main guidelines.

i. By means of theoretical assimilation of literature
ii. Exploratory social Questionnaire survey method and
iii. Electro-Encephalogram (EEG) procedures conducted in a laboratory.

The first guideline of the study is to use a qualitative analysis of reviews of literatures on *sangeetham*, Swami Tyagaya's compositions, neuro-psychology and Vedanta books to get an in-depth understanding of the respective subjects. The study enables better understanding of Saint Tyagaya's *sangeetham*, devotional music and neuro-psychology which is dealt in chapter two.

The other guideline is by quantitative analysis.The quantitative methods endorses subjectively by the Questionnaire survey methods and objectively by

laboratory Electro-Encephalogram, (EEG) investigations. The EEG demonstrates the neurological features. The survey investigates a random probe as well as triangulation of responses of the background of devotional *sangeetham*, Saint Tyagaya, brain, spirituality and neuroscience. 'Random probes provide a check on the validity of questions and yield a representative sample of verbatim comments which can be used as illustrative quotations when writing-up the research' (Gilbert, 1993:42). "They are useful and they provide illustrative material about what underlies in the justification of the thesis.(abid). However, the qualitative literature analysis followed by quantitative survey and EEG investigations would endorse stronger evidences and propose new recommendations. These evidences will be useful for the present investigation and for future researches. Therefore, the researcher prefers to discuss the combination of both qualitative and quantitative findings in order to benefit from the advantages of both the investigations. As Seale argues, "employing a range of methodological strategies means that the researcher does not necessarily privilege a particular way of looking at the social world; I would suggest that such diversity encompasses methodological plurality as well as postmodernism encouraging different voices to be heard and facilitating the exploration of different truths' (Seale, 2004:296). "Fred Moonga; and Bryman have distinctive characteristics that make the possibility of combining them especially attractive" (Seale, 2004:298).

The main subjects of the study are essentially, *sangeetham*, Swami Tyagaya's devotional compositions, Neuropsychology and spiritualism which are the combination of Theo-philosophy and science. The complexity of the study necessitates the combination of different methods to avoid possible misinterpretation of responses and barriers which may be considered as the limilation. However, the

methodology adopted in this study is both conceptual and empirical. These guide line methods endorses to understand and discuss the relationship between devotional *sangeetham*, spiritual experiences and the associated dynamics in the brain. An important contribution that exploratory research can make to our understanding is helping us to identify patterns and enabling us to give names to social phenomena (Thomas, 2000:170).

The discussion is benefitted by the application of Interpretative Phenomenological Analysis (IPA) for the Qualitative methodology. IPA has its theoretical origins in phenomenology and hermeneutics. Phenomenological methods are particularly successful at bringing to the fore the experiences and perceptions of individuals from their own perspectives. The interpretive dimension enables it to be used as the basis for practical assessment. The hermeneutic research emphasizes on the metaphysical stance, methodological grounds, quality concerns and ethical issues that contribute to its paradigmatic assumptions. Finlay 2009, further states that applied to research, phenomenology is the study of phenomena: their nature and meanings. The focus is on the way things appear to us through experience or in our consciousness where the phenomenological researcher aims to provide a rich textured description of lived experience. (Narayan Prasad Kafle, 2011:181). This phenomenon has made the study feasible in relationship to the enigmatic brain and the complex metaphysical interpretation.

Therefore, the analysis and discussion of the literature review, the survey and the EEG offers the development that will enable better understanding of Swami Tyagaya's devotional *sangeetham* and neuropsychological implication. It provides an

in-depth understanding of the responses from the quantitative method about the qualitative subject. The qualitative subject is endorsed through review of literatures while the quantitative methods of Electro-encephalogram investigation and questionnaire survey method support as a random probes on the responses of the society towards *sangeetham*, Swami Tyagaya, brain and spirituality. Random probes provide a check on the validity of questions and yield a representative sample of verbatim comments which can be used as illustrative quotations when writing-up the research' (Gilbert, 1993:42).

However, qualitative analysis of literature review and the quantitative analysis support the objective and the rationale of the study. The discussion attempts at a detailed explanation of the responses that emerge from the questionnaire survey and the neurological investigations. Therefore, the researcher prefers to combine the two methods (qualitative and quantitative) in order to compensate for the inadequacies and the advantages of both of them. The discussion is based on the 410 survey findings collected from random members of the Indian society across the country. Their answers represent their perceptions regarding the experience on devotional *sangeetham*, brain, neuropsychology, God and spirituality. The discussion of the brain science informs about the EEG experiments were performed on 34 volunteers. The results of the discussion denotes that the data collected from the survey and the EEG signals show positive public perception on devotional *sangeetham*, Swami Tyagaya, mediation, brain science and spirituality.

The discussion of the EEG infers that in this modern era, science can be used as a valuable tool to explore the dynamics of the brain towards *sangeetham* and

spirituality. The concept associated with Swami Tyagaya's devotional *sangeetham* and spiritual dimension in association with the brain indicates inspiring knowledge about the architecture and physiology of the brain. The EEGs certainly indicates classified electrical signals in relationship to the input of devotional *sangeetham*. The study proves that the emotional processing in the special brain areas focuses the 'God Realisation' or the visualization of Lord Rama.

The researcher provides important illustrations throughout the study about *Sangeetham*, Swami Tyagaya, God, Brain and spirituality. The strength of the discussion are essentially in Swami Tyagaya's devotional *sangeetham*, Neuropsychology and spiritualism. The discussion and inference of the complex study necessitates the combination of three different methods (qualitative, survey and EEG) to substantiate the rationale and the objective of the thesis. The overall discussion proves the four objectives of the study. Bryman (2001) has argued that research methods are rooted in epistemological and ontological commitments; the epistemological positions in which the two methods (quantitative and qualitative) are grounded constitute irreconcilable views about how social reality should be studied (Seale, 2004:294). Philip (1998:34) echoes this distinction and notes, 'recognizing this destabilizes the distinction between the two approaches and therefore their apparent incompatibility'. The discussion and inference of the complex study necessitates the combination of three different methods (qualitative, survey and EEG) to substantiate the rationale and the objective of the thesis. The discussion on the questionnaire survey results is presented in Part A and the discussion about EEG results are presented in Part B.

5.4 THE DISCUSSION ON THE FINDINGS OF THE QUESTIONNAIRE SURVEY

The discussion information comes from the vital statistical findings of the questionnaire survey. The validity of the observed studies has identified significant links between *sangeetham*, devotion, religion, mental health and spirituality. Typically, religion and spirituality have been measured by global & national indices (e.g., Questionnaire survey- such as; interest in music, God, brain and theology. The frequency of devotional attendance, self-rated religiousness and spirituality). The implication is that the survey specifies the goodness of devotional music, spirituality and its influence towards good mental and physical health. Statistical and demographical data provides the record of the spiritual growth of the local Indian society. The statistical data provides the understanding of the study to satisfy the devotional situation and the mental aspect in the vision of God. The study of the people can make a significant impact on the perception of devotion and God. The demographical information will determine the significance of the scientific rationalization of the discussion on *Sangeetham*, Swami Tyagaya, brain, meditation, God and spirituality.

The statistical data establishes the inferential analysis of the Six Null Hypothesis statements. Accordingly, the study identifies from the data the 6 major factor areas namely, 'spiritual factors', 'divine reliance', 'brain science', 'spiritual relevance', 'God and man' and 'God and brain'. These six factor dimensions explain approximately 60 percent of total variation. The evidences from Swami Tyagaya's compositions replaces the six null hypothesis with six alternate hypothesis. The statistical Correlation of the major variables factors has produced encouraging

correlation and relevance to the study. The discussion reports about the essential findings to establish the background knowledge of Swami Tyagaya's *Sangeetham* and its relevance to devotion and the neuro-psychological changes with the guidance of Tables 1 to 34 in Chapter 4.

The implication identifies the validity of the significant links between Swami Tyagaya's *sangeetham*, society, spirituality and mental health. The *sangeetham*, science, religion and spirituality have been measured by global & national indices (e.g., Questionnaire survey- such as; interest in music, God, brain and theology. It shows the frequency of devotional attendance, self-rated religiousness and spirituality). The inference specifies the goodness of Swami Tyagaya's devotional music and its influence towards good mental and physical health. The reliability and its validity of the spiritual findings are relevant for the study.

5.4.1 THE DEMOGRAPHICAL FINDINGS (Table 1 - 5)

The demographic analysis indicates the criteria of the local society about the relationship of the biological processes influencing its knowledge about the understanding of the issues of Swami Tyagaya, *sangeetham*, brain, God and spirituality. The values of the demographical statistics are discussed below under the headings, 1. Gender, 2. Age, 3. Education, 4. Occupation and 5. Socio-economic status.

i. The Gender catogery (Table 1), indicates that the female participants of 64.9% were about two times more than the male paricipants of 35.1% denoting that the female distributation was more which may imply favourable religious faith. The

keen interest of the women for devotional music and religious growth inspires the survey. The Gallup polling organization findings in 2002, those women hold their beliefs firmly and practice their faith more consistently than men. It was reported that men are less religious than Women (R. R Brit, 2009:4). The devotional and religious growth of the local Indian society lies mainly among the women.

ii. The Age catogery, (Table 2) indicates that, 43% of participants were less than 30years old and 58% were more than 30 years old. There were a good mixture of young and old people. The paricipants of 60 years and above were 14%. The observation is that the process of aging at every stage of life brings about increase faith and spiritual reliance. The finding is that 43% of youngsters were University students and most of them were keen to express their concern on devotion, *sangeetham*, meditation and faith. The cultures of the young and old participants in the local society has a sound knowledge towards psycho-spiritual needs.

iii. The Education catogery, (Table 3) signifies of the 76% of participants as college educated which is a high proportion. The secondary school eduction participants are 20%. The observation is that about 96% of the survey group are educated members of the society. The educated participants command a significant percentage value for the understanding of the philosophic and science subjects of the questionnaire. The educated participants command a significant value for the appreciation of the questionnaire. Their level of

religiosity and the level of scientific education augurs well for the inquiry of *sangeetham*, Swami Tyagaya, neuropsychology, spirituality and faith.

iv. The Occupation catogery, (Table 4) denotes that 49.5% are professionals and 29.8% are university students and the rest 5% are retired participants. These values correspond to the significance of mixed group participation. The observation is that professionals and students comprised 80% participation and their opinion are significant for the study. Their views are noteworthy for the correlation of Swami Tyagaya's *sangeetham* towartds spirituality like tolerance, compassion and love. The viewpoint of the 80% educated participants in the matter of science, *sangeetham*, God and spituality are significant.

v. The socio-ecconomic catogery, (Table 5) implies that 86.8% are from the middle income group and 9% from the upper income participants. The observation is that the middle class understanding on religious and scientific matters are significant in an economically developing country. The values of the middle income group are constantly changing and so are their devotional affliation. The 86.8 % participation can give a better correlation of the socio-ecconomic participation. The big middleclass viewpoint on *sangeetham*, God, science and spituality are absolutely significant.

The summary of demographical findings are based on the five important points.

i) female participants are more which is 64.9%.

ii) There are a good mixture of young and old participants which is 43% are young and 58% of participants were older.

iii) The surveillance denoted 96% educated participation which is excellent. The educated participants command a significant value for the understanding of the philosophic subject of the question.

iv) The observation is that professionals and students comprised 80% participation which shows varying opinions of religious and scientific matters.

v). 86.8% of the participants were from the middle income catogery and their viewpoints were significant on matters conserning Swami Tyagaya's devotion, carnatic *sangeetham*, brain , God and spirituality. Therefore, these demograhic analysis are significant for the systematic assesment of the wide varity of research outcome conserning Swami Tyagaya, *sangeetham*, brain, devotion, God and spirituality .

5.4.2 DISCUSSION ON THE DEVOTIONAL *SANGEETHAM* RELIANCE

(Table 6 - 9)

The statistical data provides the society's understanding of carnatic *Sangeetham* inorder to satisfy the devotional relationship and the mental aspect of God. The demographical information will determine the significance of the scientific rationalization of devotional *sangeetham* with neuro-psychology. The questions makes a significant impact on the perception of *sangeetham*, devotion and Swami Tyagaya. The implication is that the survey specifies the goodness of devotional *sangeetham* towards spirituality which is relevant to the study. This section is discussed with selected four questions and with their corresponding tables.

i. Do you enjoy listening to carnatic *Shastria Sangeetham*? (Table 6). The findings indicate that 75.2% enjoy listening to Carnatic *Sangeetham*. The total participants were 410. The value indicates keen interest for devotional Carnatic *sangeetham*. This high percentage inspires the aim of the study. Carnatic *Sangeetham* (South Indian classical music) has a very special charm on the human mind because of its devotional charisma and the design and function of spiritual implication. The way of life, their God, their mood, their nature and their history are predicted in the quality of their music. Carnatic Shastria *Sangeetham* is devotional, spiritual, philosophical and meditational (Gopalan, 2003:ii).

2. Do you listen to devotional music or *keerthanas*? (Table 7). The findings denote that 88.5% like listening to devotional music. The finding percentage indicates keen interest for devotional *sangeetham* and the findings inspires the study. The *sangeetham* represents divine feelings, emotions like pleasure, pain, love, hatred, heroism, knowledge, marriage, birth, death and Gods (Prajnananda, 1973:1).

3. Do you consider singing devotional music to be an important part of life? (Table 8). The findings denotes 90.3% consider singing to Carnatic *Sangeetham*. The percentage indicates that singing devotional *sangeetham* is important practice in life. During the 17th century the great Bakthi movement in South India promoted the value of singing devotional *sangeetham* to attain the realisation of God. There were many saintly singers in Tamil nadu like *Appar*, *Sundarar*, *Manikavasagar* and *Thirunavukarasar*. The greatest composer singer of Carnatic *sangeetham* was Saint Tyagaya. Saint Tyagaya's *sangeetham* functions as a

prayer and meditation. The devotional kritis, compositions are sung in particular raga, tune and particular thala, rhythm which are sustained over a prolonged period to give devotees a mystical experience.

4. "Do you consider singing devotional songs a form of meditational exercise"? (Table 9). The finding indicates that 86.4% consider singing devotional songs as a meditational exercise to the brain. The finding percentage implies that singing devotional *sangeetham* is important exercise. Living with God in mind is life and meditation through *sangeetham* is one way of achieving the goal.

The survey results of this section, "Devotional *Sangeetham* reliance", indicates that society persue devotional *sangeetham* for spirtual life. "Generally, music emerges as an important media for for devotional singing and devotional singing like prayer is incorporated in music and it is a form of meditation" (Newberg, 2010:28). Meditation involves sustained concentration and deliberate regulation of brain action and breathing. Many studies have shown that it enhances relaxation and spiritual well-being (Newberg, 2010:160). Devotional singing in the form of prayer stimulates the spiritual paths in the brain. Devotional music involves emotions and emotions are powerful energy which governs a wide variety of activities involved with consciousness, empathy, and compassion. *Sangeetham*, bhajans, kirtans, hymns are all devotional songs which accompanies religious rituals and meditation.

Each religion has its own traditions and accordingly sing devotional songs for their particular God. These devotional songs are a form of prayer and a sacred exercise. In Hindu tradition these songs are sung in a certain tune, melody and

rhythm. It is commonly called as *sangeetham*. They are sung with devotion as a communion prayer which results in meditation or mental relaxation. This prolonged singing and praying sustained over a prolonged period give rise to a mystical experience. Swami Tyagaya mentions about envisioning Lord Rama. Many Hindu sages like Appar, Sundarar, Manikavasagar, Swami Tyagaya, Annamaya and Purandaradasa have contributed to the South Indian bhakti movement.

The survey findings denote that 88.5% like to listen to devotional music and 90.3% indicates that singing devotional *sangeetham* is important practice in life. Carnatic *sangeetham* singing and meditation has been practiced since antiquity as a branch of many religious traditions. Devotional *sangeetham* brings about the concentration on singing to God which is a deep meditation. The survey indicates that 86.4% consider singing devotional songs as a meditational exercise to the brain. 75.2% enjoy listening to Carnatic Shastria *Sangeetham*.

It is mentioned in the Tamil *Thevaram* that music represents the sounds of nature which is emotional and a tribute to Iswara (God). *Appar*, 700AD, a Tamil poet sings, *"Maasil Veenaiyum Maalai Madhiyamum, Veesu thendralum veengila veynilum Moosu vandarai poygayum ponradhee , Eesan endhai inayadi neezhalee"* which means that the shelter from God is like the chaste melody of the *Veena*, the gentle breeze, the happy spiring season and buzzing bees of the lotus pond. (Kanji kamakodi, 2009:434). A Vedic sage, Yajnavalkya describes about the sacred nature of *sangeetham*, " *veena vadhana tathvanga sruti, jathi, visartha talanjaba prayasena moksha margam niyachathi"*, which signifies that one who is well educated in music of veena, tone and beat attains salvation without doubt (Kanji Kamakodi 2009:435).

Plato, the famous Greek philosopher, 500BC, says, "Music gives, a soul to the universe, wings to the mind, flight to the imagination and life to everything" (Benjamin Jowett, 1970:522).

Brain scientists indicate that the brain of a musician works differently than that of a non-musician. Dr. Andrew Newberg, is a neuroscientist and the Director of Research at the Myrna Brind Center, Thomas Jefferson University, USA says, "There's some good neuroscience research that involved in music have larger growth of neural activity than people not in music training. When you're a musician and you're playing an instrument, you have to be using more of your brain and for people who choose to meditate they create a different neural network based upon the images and thoughts they contemplate and experience (Andrew Newberg, 2010:103).

"Brain scan technology becomes more refined, I suspect we will see that imaging showed changes to the networks in the brain that represents his or her image of God" (Newberg, 2010:102). Research has also found the fundamental link between music and spatial intelligence, which means that understanding music can help children visualize various elements to improve their intelligence and aptitude.In Europe school children are exposed to Mozard's music. Mozart effect is listening to Mozart's music which can induce improvement in mental task (Levitin; 2006;194).

Saints promote devotional singing to help build compassion, kindness, tolerance and love. This devotional meditation calms the mind and stimulates specific brain centres. This act may involve generating the emotional feelings. Meditation

often regulates the mind and eases many health concerns. 86.4% of the survey candidates consider singing devotional songs as a meditational exercise to the brain. The finding percentage implies that singing devotional *sangeetham* is important brain exercise. The statistical data provides the understanding of the Carnatic *Sangeetham* in the society which is relevant to the theory to satisfy the devotional relationship and the mental aspect in the vision of God. The inferences of the literature evaluation on the devotional *sangeetham* of Swami Tyagaya and the statistical findings of the survey substantiate the second and fourth objective of the study.

5.4.3 DISCUSION ABOUT SWAMI TYAGAYA, HIS DEVOTIONAL KEERTHANAS AND SPIRITUAL FACTORS (Table 10 - 14)

Swami Tyagaya is also called as Thyagaraja. He lived in Tiruvaiyaru, Tamil Nadu in the seventeenth century. He was a prominent and a prolific composer of classical *sangeetham*. He was totally immersed in his devotion to Lord Rama and therefore he experienced the spiritual vision of God. He expounded that nada yoga can guide a devotee towards spiritual realization. The survey findings determines the significance of Swami Tyagaya and his devotional *sangeetham* with the association towards faith, compassion, righteoussness and God. The statistical data provides the society's understanding of Swami Tyagaya, *Sangeetham* and God. The results satisfies the devotional relationship and the mental aspect in the vision of God which is relevant to this study. This section is discussed with the selected five questions and with the statistical results.

1. Do you think that it is possible for Swami Tyagaya a great saintly musician of the 17th century to have visualised God Rama? (Table 10). The findings indicate that 49.8% agree in Swami Tyagaya visualising of Lord Rama. The finding percentage indicates that 18.8% disagree. The 49.8% value of the findings inspires the outcome of this study.

2. Do you agree, Swami Tyagaya expounds that devotional *Sangeetham* is importanbt to understand God? (Table 11). The findings indicate that 53.9% ageee in Swami Tyagaya view that his devotional *sangeetham* is important to understand God. 17.8% of candidates disagreed. The 53.9% value of the findings motivates the idea of the study.

3. Do you agree, Swami Tyagayas poetry shows ways to be spiritual and understand God? (Table 12). The findings indicate that 52.5% ageee in Swami Tyagaya view that his devotional *sangeetham* is important to understand God. 21% of candidates disagree. The 52.5% feel that SwamiTyagaya's Devotional *Sangeetham* shows the way to understand God. The finding inspires the the study.

4. Do you agree, Tyagaya s compositions direct the right path in life? (Table 13). The findings indicate that 52% ageee in Swami Tyagaya view that his devotional *sangeetham* shows the right path in life. 17.6% of candidates disagree. The 52% value of the findings inspires the spiritual idea of the study.

5. Do you agree, Tyagopanishad infuse faith and compassion? (Table 14). The findings indicate that 49% agree that Swami Tyagaya's compositions infuse faith and compassion. The 49% value of the findings indicates the message of righteousness.

The statistics of this section, indicates that through Swami Tyagaya's *sangeetham* one can attained spiritual realization. Swami Tyagaya composed hundreds of devotional compositions and in praise of Lord Rama and many of them are popular today. His passion for the vision of Lord Rama grew intensely. He saw and felt God in all names and forms. In the theological tradition faith leads to experience and through consciousness God is visualized. It is shown that devotional *sangeetham* has meditational implication to the brain. Tygaya's devotional message tells the experienced of the divine reality and the exuberant joy, confidence and a feeling of intimacy to Lord Rama. 53.9% ageee in Swami Tyagaya view that his devotional *sangeetham* is important to understand God, Lord Rama.

His literature is highly developed in devotional narrative and in its intellectual insight, and in its musical attitude. The glory of his literature lies in his religious imagination and in his emotional qualities. His kritis creates a religious sentiment and a divine awareness to Lord Rama. More that 52% agree in Swami Tyagaya's view that his devotional *sangeetham* is important to understand God. Inorder to emphasise the significance of devotion to attain salvation, Swami Tyagaya in his kriti "Mooksamu galada" says " Is it possible for one who is devoid of real devotion and knowledge of divine music attain salvation" (Ramanujachari, C., 1958:591).

Vedic literature explains *sangeetham* is an emergence of *Nadabrahmam*. AUM is honoured as the pranava mantra. *Sangeetham* is an interplay of melody, harmony and rhythm. Melody is what results from playing notes of different pitches. Harmony is the relationship between different notes played at the same time. Rhythm is what results of combining notes of different durations (Swami Prajnanda, 1973:15). *Omkara* is the *pranavamantra* which is radiating as the *saptasvara*. The Bhakti tradition of India in the 16th century believes that devotional *sangeetham* can function as a communion prayer and meditation called as *divayanamasangirtanam* (Sambamurthy, P., 1994:31). The *kriti*s are repeatedly sung in particular sruthi, ragas, talas and thoni which when sustained over a prolonged period give rise to brain changes to the devotees. The resultant intense emotion gives rise to a spiritual experience. Swami Tyagaya experienced the vision of God through his devotion and righteous living. Tyagaya's *sangeetham* calms the mind and stimulates specific emotional centres in the brain giving rise to visualising God. This act may involve regulating the mind. Neuroscientist show activated brain areas when in meditation or in mystical union with God.The EEG and the fMRI are able to illustrate this phenomenon.

The survey findings emphasizes that Tyagaya's devotional message includes educational endeavours and deepens divine faith for the process of spiritual growth. His music gives a special radiance of divine joy. A study of the different world religions will enable one to understand how each religion views spiritual development within its unique belief system. The participants viewpoint of matters conserning devotional *sangeetham*, meditation, God and spituality are significant and relevent for the first, second and fourth objective of this study.

5.4.4 THE DISCUSION ABOUT GOD, BRAIN, SPIRITUALITY AND FAITH

(Table 15 - 27)

According to theo-science, the spiritual vision of God, the spiritual realization and spiritual experiences are all mental pictures. This section deals with how devotional music and meditation affect brain activity. Neuro-science observes increased activity in the frontal, parietal,temporal, occipital lobes and the language area of the brain. Dr. Newberg believes that for the brain, praying to God in the meditational tradition where they are visualizing something, we might expect to see a change or increased activity in the visual part of the brain (Newberg, 2010:89). Many saints of different religious faiths have mentioned about their God experiences. Music plays an important role in devotional experience. Various studies have been done to answer how music acts on the brain. It is believed that devotional music has a great influence in an individual's spiritual development. This may be due to the interaction that occurs in the various parts of the brain network. The statistical data provides the understanding of God, brain, meditation, music and faith in the society. The data is relevant to this study inorder to satisfy the scientific and the spiritual knowledge. This section provides with thirteen selected questions and with their corresponding.

1. Do you believe in God? (Table 15). The findings indicate that 97.3% overwhelmingly believe in God and 2.7 % do not believe in God. There is an overwhelming sense of God presence. Many believe in God because they know that God is real and they can feel His presence because He is in their body, mind and soul.

2. Does God exist? (Table 16). The findings indicate that 87.3% strongly agree in the existence of God and only 5.2% strongly disagree. The 87.3% believe in the existence of God has enormous implications on the views of creation, life, destiny and humanity.

3. Is God a mental image? (Table 17). The findings indicate that 46.6% agree that God is a mental image and 34.3% disagree. 87.3% agree in the existence of God. The God experience is thought of as an mental image. Mental image plays an important role in memory and intelligence. Science explains that the brain activates special neural centres. Neuro-psychology is an immerging scientific field and therefore 46.6% acknowledge the mental role.

4. Is God necessary? (Table 18). The findings indicate that 83.9% agree that God is necessary and 5.4% disagree. For thousands of years, man has worshipped God and so God is a part of him. Man understands that there is a big force behind the universe, the sun and the earth. Naturally 83.9% participants feel the necessity of God.

5. Is Is there a God spot in the brain? (Table 19). The findings indicate that 56.9% agree that there is a God spot in the brain. Many Neuro-Scientists, philosophers and theologians argue about whether religious belief is a genetic or a society phenomenon. Modern scientist prove that the special neural activity in the brain network have religious function. Dr Andrew Newberg and his team at the University of California at San Diego claimed to have identified the "God Spot," in the frontal cortex that is activated during religious chanting or devotional

meditation. He said God exists in every persons brain (Newberg, 2010:43). The amygdale plays an indirect role in the control of the emotional responses. The 56.9% of response indicates the rationalistic thinking of the candidates. The more one believes in his devotional singing or chanting or meditating the more the response will be in the brain.

6. Does the brain have an attraction towards music? (Table 20). The findings indicate that 83.4 % agree that the brain has attraction for music. The brain depends on neurons. The neurons communicate with each other by electrical pulses and nerotransmitters. Scientific study indicates that the musical information through the ears, eyes, skin register in the brain cells. Music has a common denominators which are pitch, timing and timbre or melody and harmony. The brain uses the sound impulses to make sense of them all. The sound impulse of the music activates the emotion centres of the brain which give rise to ectasy, happiness or sadness. Newberg found an increase of activity in the meditators' frontal lobe. These neural structural changes were greatest in the nerve fibres connecting the *anterior cingulate*, the part of the brain which helps regulate emotions and behavior (Newberg, 2010:30). Newberg says that there are considerable evidence documenting the effects of pleasant music on the brain (Newberg, 2010:35). He evaluates that what's happening in people's brains when they are in a deep spiritual practice like devotional singing, meditation or prayer (Newberg, 2010:36)

However, it is just as likely that devotional *sangeetham* can cause a meditational effect in the cortex. Neurotheological studies show a link in theology and

science. Devotional *sangeetham* of the likes of Swami Tyagaya can activate the brain to visualize the "God imagery". This scientific knowledge has given a remarkable window into what it means for people to be religious or spiritual or to sing devotional songs as a practices. The 83.4% finding does specifically acknowledge the notion that there is a religious or spiritual or divine presence in the brain. Therefore singing and listening to devotional music makes the devotee feel good and emotionally elevated. Dr Levitin, a prominent psychologist of McGill University said. "We're using music to better understand brain function in general" (Levitin, 2006:11). Patel suggests "Evidence says that both language and music represent their sound categories bilaterally in auditory cortex". (A. Patel, 2008: 63).

7. Can Saints communicate with God? (Table 21). The findings indicate that 68.5% agree that Saints can communicate with God and 19.8% remain neutral. Among the Hindus saints are those who show a great degree of righteoussness and sanctity in daily life. These saints often renounce the world and live as mystics or swamis. They are special kind of people who have attain the status of Gods. Saints establish contact with God through spiritual practice. Mostly a vision of God is obtained with the subtle sense organs of vision or hearing. God conveys divine messages to the peolpe through the divine saints. Swami Tyagaya was one of them. A saint is believed as someone through whom one catch a glimpse of what God is like. There are incidents that Tyagaya visulaized Lord Rama which are noted in his poems. Swami Tyagaya says in his *kriti*, "*Paramaattmudu*", "Know how God shines in glory in everything, human beings, creatures, nature and in devotees" (Ramanujachari, 1958:281).

8. Is God created in the brain? (Table 22). The findings indicate that 68.5% agree that God thought is a creation of one's brain and 18% remain neutral and 12.7 disagreed to the statement. Science explains that the number of neuron connections that matters for the brain to receive, analyse , store and react for any information. The brain cells play a unique and dominant role in the dynamics of visualization of God. It may be a pre-determined genetic profile, the way your brain is trained by intrinsic and extrinsic factors. The brain cells stimulates electro-chemical neurotransmitters like endorphin, dopamine, serotonin from the synapses (Newberg, 2010:56). The God behavior system may be through frontal, temporal, limbic system and hippocampus of the brain. Sophisticated neuroimaging has revealed functional and even structural changes in the brain. Dr Newberg says, "God is as a result neuroplasticity of the brain. Contemplating God will change your brain. Religious and spiritual meditation changes the brain by a mechanism called neuroplasticity; the ability of the brain to structurally rearrange itself" (Newberg, 2010:14). Dr Ramachandran spoke of Dr Persinger thus, "there is one man in Canada who stimulated his temporal lobe and experienced God" (Ramachandran, 2012:175). The findings in Table 19 denotes that 56.9% agree that there is a God spot in the brain. Future sophisticated electrophysiology may relate more on the brain activity and God.

9. Is spiritual feeling related to God feeling? (Table 23). Spiritual emotion is a state of communion with God. It is related to the sub-conscious mind. Spiritual emotion transcends from the physical level to a metaphysical level and experience a spiritual experience. Spiritual experience gives rise to a divine bliss or a superlative happiness. It is a subtle extra-sensory perception. It is an ability

to perceive the subtle dimension of the spiritual world of Gods, angels, saints and heaven. Spiritual experience is the subtle God experience. Dr Ramachandran says about God thus, "It seems that humans can ponder the infinite or wonder the meaning of it all" (Ramachandran, 2012:176).

The findings indicate that 75.9% agree that spiritual feeling related to God feeling. It is documented in the kriti "giripai nelakonna" that Swami Tyagaya in last days had a spiritual vision of Lord Rama on a hill with holy people worshipping him. Lord Rama promised to take him to heaven in 5 days (Sambamurthy, 2001:110).

10. Do you meditate? (Table 24). The findings denote that 55.4% meditate and the rest of 44.6% do not. Meditation means differently in different context. Meditation as a form of contemplation has been practiced since ancient times as a component of numerous religious traditions and faiths. Meditation is predominantly practised for spiritual purpose but of late it plays an important role for health concerns. It may be involved in creating an emotional state of contemplating on God (Yatiswarananda, 1998:232). Swami Tyagaya's *sangeetham* is a form of meditation. It creates a calming effect on the individual.

In Hinduism, meditation is called as yoga. Meditation is practised to realise union of the *athman* with the *Brahman*. This experience is referred as *moksha*. Dr Newberg states, "Meditation is certainly one of the best ways to enhance the neural functioning of your brain (Newberg, 2010:150). Activities involving intense *sangeetham* or meditation or prayer strengthens specific brain areas

causing emotional elevation towards compassion, love and tolerance. The image scanning methods have scientifically proved positive evidences. Swami Tyagaya's observation of devotional meditation in the form of *sangeetham* is the best approach for God relalisation. Swami Tyagaya was instumental for the propagation of the bhakthi tradtion in the sixteenth century in South India (Sambamurthy, 2001:87).

11. Does Meditation improve spirituality? (Table 25). The findings denote that 90% agree that meditation improve spiritual feelings. Meditation is predominantly practised for spiritual purpose. It may be involved in creating an emotional state which is a state of communion with God (Yatiswarananda, 1998:318). God emotion transcends from the physical level to a metaphysical level and experience a spiritual experience. Spiritual experience gives rise to a Godly bliss or a superlative happiness. The findings denote that 90 % agree that meditation improve spiritual feelings. Dr Andrew Newberg discusses in his book "How God Changes Your Brain", matters concerning meditation and spirituality. His research correlates distinct connection between devotional songs, meditation and neuro-psychology of the brain.

Searching God is spiritual action and it related to individual practice. It may be in the form of singing devotional songs or chanting prayers which all amount to meditation. It is aimed to develop a sense of oneness with God.William Atkinson in 1901 said; I believe that the mind of man contains the greatest manifestations of energy that the body controls the mind. I believe that man is rapidly growing into a new plane of consciousness and something within there is

an Infinite Power and we have a momentary glimse of its existence..a momentary consciousness of Oneness with the Absolute (Newberg, 2010:119). Meditation is a skill that can be trained systematically. Rishis, monks and nuns practise to realise the union of the self with God. This experience is believed to improve spiritual experience.

12. Does repeated meditation singing or chanting activate the brain? (Table 26). The findings denote that 79.3 % agree that repeated meditation singing or chanting activate the brain. Dr Newberg reports that he has conducted Kirtan Kriya meditation for 8 weeks, and have found very promising preliminary outcomes in terms of the impact on brain function (Newberg, 2010:24). Kirtan Kriya is like chanting of mantras in a meditative form. The overall evidence clearly demonstrates that most form of devotional singing or chanting will exercise the brain and promote cognitive health. Brain science explains that such meditative *sangeetham* strengthens specific areas in the brain such as prefrontal, frontal, orbital, anterior cingulate, basal ganglia and other regions. The brain cells activates consciousness, clarity of mind, reality, empathy, compassion, emotional balance (Newberg, 2010:28).

The brain cells play a unique and dominant role in the dynamics of visualization of God. Newberg says, "we can keep the brain cercuits healthy and improve it by incorporating meditation into our daily activities, regardless of our beliefs" (Newberg, 2010:29). In the same way, Swami Tyagaya's Spiritual experience gave rise to Divine bliss through his daily practice of devotional *sangeetham*. Swami Tyagaya's observation of devotional meditation in the form of

sangeetham is the best approach for God realisation. Many of his *kriti*s like "*Yella ne daya rathu*", "*Nanu palimpa*", "*Kannu kontini*", speak of God realisation.

13. Do you require faith to love God? (Table 27). The findings indicates that 69.5% agree that faith is required to love God. Man is a social and a spiritual being. He would benefit through spiritual practices love, compassion, tolerance, selflessness and health. Having hope and fath are essential, but something more is needed: the skill and discipline to organize the brain in ways that will successfully motivate life (Newberg, 2010:21). The activities involving intense *sangeetham* or meditation or prayer strengthens faith and therefore specific brain areas activates devine emotions. Swami Tyagaya practiced *sangeetham* with great faith and love (Sambamurthy, 2001:42).

The discussion successfully validates that the essential ingredients for Divine realization is righteous life style, persistent devotion to God, regular *sangeetham* recital and deep spiritual contemplation. The realisation is a creative desire, a holy inspiration and a communication with the supernatural entity called God. God is attained through devotion, meditation and faith.

All the findings overwhelmingly substantiates that Swami Tyagaya's *sangeetham* can attained spiritual realization. The main findings of the survey infer that 97.3% overwhelmingly believe in God and 83.9% agree that God is necessary. 56.9% agree that there is a God spot in the brain and 68.5% agree that God thought is a creation of one's brain and 68.5% agree that Saints can communicate with God. The

findings indicate that 75.9% agree that spiritual feeling is related to God feeling and 90% agree that meditation improve spiritual feelings. 79.3% agree that repeated meditation singing or chanting activate the brain and 83.4% agree that the brain has attraction for *sangeetham*. 69.5% agree that faith is required to love God. The high statistical percentage stand as strong evidence to prove the first, second and fourth objectives of this study.

5.4.5 The Statistical Correlation of the Major Variables (Table 28)

The statistical data of the survey on Swami Tyagaya, *sangeetham*, God, brain and spirituality inspires the association of devotional *sangeetham* in the realization of God. The public opinion makes sense that God is the part of the brain. The study correlates the brain phenomena with the subjective experience of Swami Tyagaya's devotional *sangeetham*. The correlation implies to a broad statistical relationship involving the random variables. The data suggests that it is not normally distributed and therefore a non-parametric test is employed. The findings from the test responds to the research questions and help to solve the objective of the study. The common characteristic is that there are many significant correlation of the major variables of Spiritual experience, Swami Tyagaya, Devotional sangeetam (music), Brain Science, God and Brain, income, Family status, Education, Age which are interperated through SPSS 22 output. The results in Table 28 reveals the findings.

The observation denotes that the age, education, family status, income corelated significantly with spiritual experience, Swami Tyagaya, *sangeetham*, brain and God. These eight factor dimensions explain approximately 60 percent of total variation. The observation is that the development is predominantly neuro-psychological and

the orientation is attributed to the foundational ideas that have helped to leverage this positive results. The positive correlation are the significance for the creative power of Swami Tyagaya's *sangeetham,* for neuro- psychology of spirituality, and experiential relevance of God. The impacts of these factors produces encouraging correlation and relevance to the subject of the study. Tyagaya's spiritual reliance through *sangeetham* produces significant impact in the brain.

In conclusion, the correlation of spiritual relevance of devotional *sangeetham*, brain science, God, Swami Tyagaya's Divine reliance, age, education, income and family status have produced significant statistical association to the study. The findings show satisfactory dependence between the variables. The impact of the statistical factors have produced encouraging correlation and relevance. The positive statistical correlation of variables stands as evidence to prove the first, second and fourth objectives of the study.

5.4.6 DISCUSSION OF THE SIX ALTERNATIVE HYPOTHESIS AGAINST THE NULL HYPOTHESIS (Table 29 - 34)

The six null hypothesis are rejected by the six alternate hypothesis which are discussed herewith. The six tables denotes the six null hypothesis. The inferential findings are investigated using Pearson product-moment correlation coefficient on the questionnaire survey. The statastical finding are derrived based on the questionnaire survey. Each 'The Null Hypothesis' testing engages in the creation of two statements in which one hypothesis is illogical and unacceptable and the other is an alternate statement that is logical and acceptable. The alternate hypothesis will denote an investigational theory which will have an observed alternate effect of

the experiment. The alternate hypothesis will reject the null hypothesis and therefore the alternate hypothesis becomes realistic and suitable. Inferential analysis is conducted on six null hypothesis based on 1. *Sangeetham*, 2. Swami Tyagaya, 3. Devotion, 4. Brain, 5. God and 6. Spirituality.

5.4.6.1 The relationship between *Sangeetham* and devotional experience

HO_1 : There is no significant relationship between *Sangeetham* (Indian classical music) and devotional experience among Indians. (Table 29)

The alternate argument of the hypothesis is that Swami Tyagaya composed in his *kriti*, *"Nada tanu manism Sankaram"* and it says, "I bow to Lord Sankara, the embodiment of music with my mind and body. Music is the essence of *Sama veda* which is *Sa-Ri-Ga-Ma-Pa-Dha-Ni-Sa*. I bow to Him who is the protector of Tyagaya" (Ramanujachari, 1958:288). *Sangeetham* is believed by the Indians as a divine art and is venerated as *Nada Brahmam*. The *Sama veda* is thought have laid the foundation for *sangeetham* and are sung as Vedic hymns in prayers. *Sangeetham* is based on the concept of *swara*, *raga* and *tala*. The devotional references of *sangeetham* are made in many ancient literatures like Silappadhikaram, Ramayanam and Mahabharatam. The very famous *sangeethakara*s are Swami Tyagaraja, Purandara Dasa, Annamacharia, Muthusami Dikshitar, Syama Sastri, Maanikavasagar, Pattinathar and many others.

The null hypothesis states that there is no significant relationship between *Sangeetham* (Indian Classical music) and devotional experience among Indians. The

alternate hypothesis rejects the statement by the above explanation and the observed effect of the survey. The alternate hypothesis proves logically a close relationship between *sangeetham* and devotional experience. Therefore with the above rational facts the null hypothesis is rejected by the alternative hypothesis which is the observed effect of the experimental survey. The investigation using Pearson product-moment correlation coefficient showed there was moderate positive correlation between music and devotional experience $r = .476$, $n = 410$, $p = 0.00$ ($p<0.01$). The finding indicate that *Sangeetham* moderately influences the devotional experience of the Indians. Therefore, the Nul HO_1 is rejected by the alternate theory.

5.4.6.2 The relationship between *Sangeetham*, brain and God and devotional experience.

HO_2 : There is no significant relationship between *Sangeetham* and general perception on God, brain science and devotional experience among Indians. (Table 30)

The alternate argument of the hypothesis is that Swami Tyagaya relates in his *kriti "Nanu Palimpa nadasi ochithiva, na prana nayaga"* about his devotion to Lord Rama, "Have you come walking all the way to bless me. You are the secret longing of my mind, you are my vision and the purpose of my life. O Rama! You are the Lord of my mind" (Ramanujachari,1958:575). *Sangeetham* in the Indian devotional tradition is the involvement of singing with meditational devotion. The *kriti* is believed to reflect the experience of the devotee in scaling the heights of devotion towards his God. It is an invocatory song of bhakthi which is the realization of

union with the essential nature of the "Divine God" contemplated in the brain. Swami Tyagaya conveyed his dedication to Lord Rama through his *kriti*s and his righteous life. Swami Tyagaya had the ability to understand the subtle perception of God, (Lord Rama). The creation of music is a product of intelligence and the devotion elevates the emotional mind from the physical level to a metaphysical state. When such an emotional state happens, the devotional singer's sense of self begins to dissolve and the singer feel unified with the devoted object of contemplation and that is God. The divine emotion activates the brain cells. The neuro-chemical activities stimulate a creative motor-sensory system to motivate spirituality. The brain cortical centres produce divine emotions, perception, imagination, thought and memory (Roth, 2004:36).

The null hypothesis maintains that there is no significant relationship between *Sangeetham* and general perception on God, brain science and devotional experience among Indians which is rejected by the observed effect of the survey which is the alternative hypothesis. The alternate hypothesis denotes important relationship between *sangeetham*, God and devotional experience in the brain. Therefore with the above facts the null hypothesis is rejected by the alternative hypothesis which is the observed effect of the experimental survey. The investigation using Pearson product-moment correlation coefficient showed there was moderate positive correlation between music and general perception on God, brain & devotion $r = .483$, $n = 410$, $p = 0.00$ ($p<0.01$). The above finding indicates that *Sanggeetham* moderately influences the general perception on God, brain and devotional among Indians. Therefore, the Nul HO_2 is rejected by the alternate theory.

5.4.6.3 The relationship between *sangeetham* and brain

HO_3 : There is no significant relationship between *Sangeetham* and Neuro-psychology among Indians. (Table 31)

The alternate argument of the hypothesis is that Swami Tyagaya speaks about his mind in the *kriti*, "manasuloni marmamu telusuko" thus, "O mind get to know my desire that I need my Lord's blessing and his compassion" (Ramanujachari, 1958:346). Tyagaya appeals to his brain to understand his divine emotion through the dynamics of devotional music. *Sangeetham* is a cultural and devotional phenomenon. *Sangeetham* intensifies emotions. Emotion is a brain entity. The brain generates a mindful spiritual state which conveys psychological interpretation. Musical sounds are processed in the brain in the neocortex which includes a devotional experience.

The brain creates a personal relationship to the divine God. The mind of Swami Tyagaya was charged with reverence to his Lord Rama. Devotional music increases neurologically the divine emotional perception of God. The combinations of meditational devotional singing and leading a righteous life can contribute to an atmosphere of spiritual elevation and celestial tranquillity. Faith is embedded in our neurons and in our genes and it is one of the most important principles to honour our lives (Newberg, 20010:20). Music occupies more areas of the brain than language does, and that humans are primary musical species. Dr Sacks says, "we humans are a musical species no less than a linguistic one. All of us can perceive music, tone, timbre, pitch, melody, harmony and rhythm. We integrate all of these and construct in our minds using many different parts of the brain' (Sacks, 2007:1).

The null hypothesis states that there is no significant relationship between *Sangeetham* and Neuropsychology which is rejected by the observed effect of the survey which is the alternative hypothesis. The alternate hypothesis relates a close relationship between *sangeetham* and brain psychology. Therefore with the above facts the null hypothesis is rejected by the alternative hypothesis which is the observed effect of the experimental survey. The investigation using Pearson product-moment correlation coefficient showed there was moderate positive correlation between music and brain $r = .456$, $n = 410$, $p = 0.00$ ($p<0.01$). The Nul HO_3 rejected. The above finding signifies that *Sanggeetham* moderately influences the brain among Indians. Therefore, the Nul HO_3 is rejected by the alternate theory.

5.4.6.4 The relationship between *sangeetham* and holiness

HO_4 : There is no significant relationship between devotional Sangeetham and Holiness among Indians. (Table 32)

The alternate argument of the hypothesis is that In praise of spirituality, Swami Tyagaya sings in his song, "chakkani rajamargani",thus, "Oh mind, when a good and spiritual path is available, why take the wrong paths? When good milk with cream is available, why should one go for poison. The royal road to salvation is devotion to Lord Rama" (Ramanujachari, 1958:118). *Sangeetham* and spirituality are like the obverse and reverse of the same reality. *Sangeetham* in its purest sense is religion and religion in its purest sense is devotional music. Music is the universal language of the athma, soul. Most of the Indian yogis used devotional *sangeetham* for the search of their God. It is both an earthly and a heavenly treasure. *Sangeetham*

imprints itself on the brain deeper than any other human experience. “Music evokes emotion and emotion can bring with it memory.” (Sacks, 2007:66). Music occupies more areas of the brain than language does and that humans are generally musical species (Sacks, 2007:68). Recent developments in cognitive neuroscience have led to a new way of looking at music and emotion , holiness and spiritualism. There are new avenues of research opening up.

The null hypothesis states that there is no significant relationship between devotional *Sangeetham* and holiness among Indians which is rejected by the observed effect of the survey which is the alternative hypothesis. The alternate hypothesis denotes a close relationship between *sangeetham* and holiness. Therefore, with the above facts the null hypothesis is rejected by the alternative hypothesis which is the observed effect of the experimental survey. The investigation using Pearson product-moment correlation coefficient showed there was strong positive correlation between music and spiritual holiness $r = .638$, $n = 410$, $p = 0.00$ ($p<0.01$). The Nul HO_4 is rejected. This finding indicates that devotional *Sangeetham* strongly influences the spirituality and holiness among Indians. The Nul HO_4 is rejected by this alternate theory.

5.4.6.5 The relationship between Devotional reliance and Spirituality.

HO_5 : There is no significant relationship between devotional reliance and spirituality among Indians. (Table 33)

The alternate argument of the hypothesis is that Swami Tyagaya describes his reliance to God in his kriti, “Terati yaga rada” that the Supreme Being should remove

the screen of pride and envy which are responsible to keep him away from the reach of *dharma*, *moksha* and spirituality. Swami adores for devotional reliance to achieve spirituality. Devotion and spirituality are the two defining factors in determining the higher values of life. The relation between devotion and God is also the relationship between religion and spirituality. In India, there is a discipline prescribed for a devotee who wishes to be *sanyaasi* which is a austere detachment from the usual entanglements of material life. Devotion depends on austerity for spirituality. The devotional experience transforms God into a symbol representing a personal, ethical and social value. This emotional experience encourages a religious and spiritual development (Newberg, 2010:5).

The null hypothesis states that there is no significant relationship between devotional reliance and spirituality which is rejected by the observed effect of the survey which is the alternative hypothesis. The alternate hypothesis denotes a close reliance between devotion, spirituality and God. Therefore with the above facts the null hypothesis is rejected by the alternative hypothesis which is the observed effect of the experimental survey. The investigation using Pearson product-moment correlation coefficient showed there was strong positive correlation between devotional reliance and spiritual $r = .921$, $n = 410$, $p = 0.00$ ($p<0.01$). This finding indicates that devotional experience strongly influences the spiritual among Indians. The Nul HO_5 is rejected by the alternate theory.

5.4.6.6 The relationship between God, brain, Tyagaya, *Sangeetham* and spirituality

HO_6 : There is no significant relationship connecting God, brain, devotional music of Swami Tyagaya and spirituality among Indians. (Table 34)

The alternate argument of the hypothesis is that Swami Tyagaya describes his general viewpoint of God, spirituality and devotional *sangeetham* in his *kriti*, *Kalaharana Melarahare".* He asks, "O Lord Rama! Why is the delay to give me salvation? You are my saviour and i am like a bird flying around you. You are the only one to save me. I thinking of you and singing of you day in and day out. My mind is always of You. I have sought your feet and surrendered to you. You are my spiritual goal" (Ramanujachari, 1958:369). Brain-Mind Dynamics revolves around the science and psychology of the brain. During the twentieth first century the relationship between science and spirituality has been influenced by neuro-psychology. The debate about the 'God spot' in the brain or the Spiritual area in the brain is actively pursued. The modern Neuro-scientists are trying to learn more about how the brain functions during reported spiritual experiences. Dr Newberg, a famous neuro-psychologist says," If you contemplate God long enough, something surprising happens in the brain. "Devotional singing like meditation and contemplation of God for long enough can cause different neural circuits in the brain to become activated new neurons and synaptic connections are made in the brain and God becomes neurologically real" (Newberg, 2010:1). This form of spiritual development and contemplative singing exercise could strengthen neurological circuits involved with consciousness, empathy, compassion, love and tolerance (Newberg, 2010:17). Music listening, performance

and composition engages nearly every area of the brain and music is used to manipulate our emotions (Levitin, 2006:9).

The null hypothesis states is that there is no significant relationship connecting God, brain, devotional music of Swami Tyagaya and spirituality among Indians which is rejected by the observed effect of the survey which is the alternative hypothesis. The alternate hypothesis denotes a close relationship and dependence between God, devotion, brain and spirituality. Therefore with the above facts the null hypothesis is rejected by the alternative hypothesis which is the observed effect of the experimental survey. The investigation using Pearson product-moment correlation coefficient showed there was strong positive correlation between general perspective on God, brain, devotion and spiritual emotion $r = .839$, $n = 410$, $p = 0.00$:$p<0.01$). The above finding indicates that general perspective on God, brain and devotional *sangeetham* of Swami Tyagaya strongly influences the spirituality among Indians. Therefore, the Nul HO_6 rejected by the alternate theory.

Conclusion

The statastical findings which is based on the questionnaire survey shows the inferential derivation of neuropsychology, God and Spirituality which provides subjective and objective evidences on the values of Tyagaya's devotional *sangeetham*. The questionnaire survey findings are investigated against the six alternate theories which show that there are strong to moderate positive correlation between *sangeetham*, devotional reliance, God, brain and spiritualism. The six alternate hypothesis proves its rationality and acceptablity and therefore, they reject the null hypothesis. This results conclusively indicates that devotional *sangeetham*

strongly influences the spiritual experience of the Indians. It shows from the findings that good data amplifies the voice of the hundreds of volunteers who have come forward to tell their experiential views of *Sangeetham*, Swami Tyagaya, brain, devotion, God and spirituality.

Therefore, the demographic, the theoratical and the statistical findings prove and clarify the social, scientific and philosophical knowledge of Swami Tyagaya, *Sangeetham*, brain, devotion, spirituality and God. The results elucidate the pattern and nature of devotion and identified the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God". The subjective survey findings are statistically significant to arrive at a favourable conclusion and the alternate hypothesis inferences proves that the study is properly corroborated.

5.4.7 THE DISCUSSION OF THE OVERALL PERCEPTION OF SWAMI TYAGAYA, DEVOTIONAL *SANGEETHAM*, GOD, BRAIN AND SPIRITUALITY (Table 35 - 39)

This section discusses about the overall perception of *Sangeetham*, Swami Tyagaya, God, Brain, Spirituality. The discussion outlines the spiritual knowledge of the society and the philosophy of the research in association to the many theoretical assessments, such as Indian classical music (*sangeetham*), Swami Tyagaya, God, neuro-psychology and spirituality. This conclusive section indicates the viewpoint according to age, education, social status, belief, literature knowledge, philosophy, scientific opinion and audience. There are tend to be uncertainty in the expressions of the philosophy of God, spiritualism, religion and science but the best effort is

maintained to bring forth the realism. The discussion is based on the selected five findings of the survey.

5.4.7.1 Swami Tyagaya and *sangeetham* (Table 35)

The purpose of this discussion is to examine and demonstrate that Swami Tyagaya's devotional *sangeetham* plays a prominent role in the emotional centres of the brain and create a visual imagery of 'God'. In view of this fact, to the first statement, "I think that these questions may stimulate your interest in Tyagopanishad and *sangeetham"*. The findings denote that 70.2% of the respondents agree that their involement in *sangeetham* and that Swami Tyagaya's composition will increase their interest. The finding indicate that 288 respondents approve that Tyagaya's *sangeetham* is devotional and beneficial to the society.

From the analysis of Swami Tyagaya's *sangeetham* comes a strong message that God sense and spirituality is drawn from within oneself and also being directed from outside. The contemplative practice of singing devotional *sangeetham* is a form of meditation where the brain cells are activated. The intense devotion of Tyagya's *sangeetham* stimulates special brain areas which activates a spiritual dimension to visulalize 'God'. The brain dunamics is influenced by intrinsic and extrinsic factors. Newberg says, "Meditating on God's love appears to strengthen the neurological circuit that allows to feel compassion" (Newberg, 2010:53). Many respondent felt that musical ecstasy could provide the answers to religiosity and God power of love and compassion. Some respondents mean that spirituality is a result of being raised in a religious background or conservative home. 78.8% of the respondents are inspired to devotional *sangeetham*. Many people feel that devotional *sangeetham* and

meditation is orthodoxy. 90% agree that meditation improve spiritual feelings and 79.3% agree that repeated meditation singing or chanting activate the brain. 75.9% agree that spiritual feeling is related to God feeling. 70.2% of the respondents agree that their involement in *sangeetham* and Swami Tyagaya's composition will increase their interest. The devotional aspect of *sangeetham* and the meditational experience need a spiritual practice in the form of devotion, knowledge and belief. 79.3% agree that repeated meditation or singing or chanting activate the brain centers. 90% agree that meditation improve spiritual feelings. The findings indicates that 55.4% meditate and the rest of 44.6% do not. Newberg, "Meditation stimulates an important brain part, the anterior cingulate cortex which acts as mediator between emotional feelings and thought command" (Newberg, 2010:52). Swami Tyagaya's thought was filled with Lord Rama through his involvement of persistent singing devotional *sangeetham*. This was how the intrinsic and extrinsic factors influenced his brain and he envisioned Lord Rama.

The survey expresses high degree of acceptance of devotion to Tyagya's *sangeetham*. The findings denote that 70.2% of the respondents agree that their involement in *sangeetham* and Swami Tyagaya's composition will increase their interest. The statastic validated the relationship of Tyagaya with his Ishta Deva. Swami Tyagaya addresses Lord Rama as the one God and his *Ishta-Deva*. He says that Lord Rama is the source of everything, immanent in everything and the essence of everything. He magnifies Lord Rama as the Supreme Brahman, devoid of beginning, middle and end (Ramanuchachari, 1958:582). *Sangeetham* is believed to be a divine art among the Indians. It originates from the Sama veda. The *sruthi*s, *swara*s and *raga*s are like mantras and originates from the saptasura. They are set

from the sacred syllables *AUM*, the Pranavamantra and the resonance of the sruthi and swaras attracts the mind and leads the devotee to a inner divine experience (Ramanuchachari, 1958:591). There are several health studies showing that *sangeetham* and meditation improve abnormal movements like Parkinsons disease and deteriorating memory like Alzheimer (Newberg, 2010:30). Many researchs show that children receiving classical musical training are in advantage for verbal working memory, inteligence and cognative skills (Newberg, 2010:31). Carnatic *sangeetham* eases pain and reduces mental worries. *Sangeetham* is used for health therapy, for example, emotional, behavioral or mental health problems, learning or physical disabilities, life-limiting conditions, brain-injury or neurological conditions and physical illness. Research on devotional *sangeetham* is conducted in many cities throughout the world.

The 70.2% and 90% agreement indicates that Tyagaya's *sangeetham* is devotional and plays a role in envisioning 'God'. The statastic validates the relationship of Saint Tyagaya with his Ishta Deva, Lord Rama with the message of devotion and spirituality. The verdict is relevant to the first objective of the thesis in the characteristics of Swami Tyagaya devotional *sangeetham* plays a prominent role in the emotional centres of the brain.

5.4.7.2 God experience (Table 36)

The purpose of the discussion is to explain that Swami Tyagaya's *kriti*s are devotional in character. His compositions are devotional because he experienced God. Swami was a great devotee of Lord Rama and his kritis exhibited holiness and nobleness. *Sangeetham* is the rendition of kriti which is based on a particular raga and

thala which represents melody and harmony. The *kriti* is structurally *pallavi*, *anupallavi*, *charanam* and carries the spiritual message. To the second statement "I believe that these questions may inspire your awareness in Devotional music". The findings in Table 36 denote that 78.8% of the respondents are inspired towards devotional music. *Sangeetham* is believed to be a divine art form which is venerated as *Nada Brahmam* (God).

God (*Brahmam*) can denote in a diversity of ways according to the Hindu religion. To the different kinds of the societies, 'God' can mean a variety of things. Most of the descriptions of "God" focuses on the senses and that spiritual experiences are necessities of everyday life. Many respondents mean that God experience is simply an experience that is out of the ordinary while some mean it as a deep, moving, mind altering experience. 97.3% of the candidates overwhelmingly indicate their believe in God and 83.9% agree that God is necessary. To the question, Who was God? Many feel that God is love and Love is spirituality and spirituality is compassion. Many respondents value love as predominant and they wish to live in a world of love. Many candidates want spirituality to be universal and they value the devotional aspect of *sangeetham*. Newberg says, "It is easy to embrace the notion of God but far more difficult to experience the qualities associated to it.The unitary experience transforms God into a virtually indescribable sensation. This is true for advance meditators who feel peaceful and relaxed as they experience deeper levels of awareness and the time and length of practice clearely influence one's ability to experience the mystical God (Newberg, 2010:127).

Swami Tyagaya was a extraordinary composer and composed hundreds of devotional compositions in praise of Lord Rama. He was highly influential in the development of Carnatic *sangeetham*. He was totally immersed in the devotion of Lord Rama. Tyagaya conveyed his spirit of devotion through engaging in righteous living and praying by singing his composition. His spirit of *sangeetham* puts Lord Rama in all things. The findings denote that 88.5% like listening to devotional music. 86.4% consider singing devotional songs as a meditational exercise to the brain. 52% ageee in Swami Tyagaya view that his devotional *sangeetham* is important to understand God. The survey findings indicate that 49.8% agree in Swami Tyagaya visualising Lord Rama. Many participants feel that the Swami Tyagaya's *sangeetham* is a spiritual experience and the *sangeetham* knowledge produces emotional joy which shows the divine path. The devotional ecstasy to Lord Rama showed Swami Tyagaya the spiritual enlightenment of communicating with God and therefore he was called a saint. 68.5% of the respondents agree that Saints can communicate with God. Swami Tyagaya communed with God through music and had contributed a great deal for the propagation of devotional music in South India (Sambamoorthy, 2001:11). Tyagaya comprehended the cosmic laws of divine music and through his compositions he enlightened the society with compassion. He advocated that the sacredness of music is beyond logical analysis but often comprehensible through personal intuition (Sambamoorthy, 2001:85). According to Swami Tyagaya's spiritual philosophy, the mission of human life is to comprehend the *Athman* (soul), and work towards attaining "*Moksha*" (Salvation) (Sambamoorthy, 2001:47). *Brahmam*, (God), has the qualities of *Sat, Chit* and *Ananda* meaning Truth, Intelligence and Happiness respectively and *Brahmam* is in the nature of omnipotence, omnipresence and omniscience (Swami Yatiswarananda, 1998:302).

Among the Indians, music is believed to have a divine origin because it has its roots in the supreme sound which is known as *Sabta-Brahman* (Prajananda, 1973:14). It is believed that "God" is comprehensible through personal intuition and meditation. Civilizations whether religious or non-religious understand the concept of devotion and God. The meaning of devotion differs from one individual to the other. The devotee's faith strengthens his devotion.

The survey denotes that 78.8% of the respondents are inspired towards devotional music. The survey indicates high degree of recognition for devotional *sangeetham*. The evaluation appropriately fulfills the first and fourth objective of the thesis that Swami Tyagaya devotional *sangeetham* plays a prominent role in the in the perception of God and devotional spirituality is the need for the society.

5.4.7.3 Brain and Science (Table 37)

The discussion in this section explains the role of neuro- science in the recognition of God as a brain creation. To the third statement, "I trust that these questions may arouse your attention about the God centre in the brain". In Table 37 the findings denote that 78.8% of the respondents interest in the God centre in the brain is elevated. Generally, society thinks that neuro-science is the knowledge of the brain and that there is no possibility of God vision there. The findings of the survey on Swami Tyagaya, *sangeetham* and spiritual factor and God, brain,spirituality and faith indicates 75.9% respondents felt quite the reverse. They felt that neuro-psychology is getting in touch with God or a supreme emotion from the brain and some felt that neurosychological experience is getting to know with a power that lies inside oneself. Many believed that God is a contemplation on a

potential energy and the contemplation is turned spiritual. Dr Joan Stiles, a noted neuro-scientist explains, "The brain is an intrinsic biologic factor which is controlled by the genes while the vision of God is an extrinsic functional factor which is controlled by experience" (J. Stiles, Youtube). The intrinsic and extrinsic factors complement one another in the development of brain and its function (abid). This information directs the researcher to illustrate that the brain gets conditioned by the input of God information through Swami Tyagaya's *sangeetham* or other devotional stmulii. Brain is a information processing network associated with the function of vision, hearing, intelligence, memory, coordination and communication etc. The brain network activity can be recorded by the EEG and scaning methods. The brain contains a 'map' of different musical pitches and different areas of the brain respond to different pitches and we could place electrodes in the brain and be able to determine the activity of the brain (Levitin, 2006:27). The finding of the survey (Table 17) points out that, 46.6% agree that God is a mental image and 87.3% agree in the existence of God (Table 16). 83.4% agree that the brain has attraction for devotional music (Table 20). 75.9% of the participants agree that spiritual feeling is related to God feeling (Table 23) and 69.5 % agree that faith is required to love God (Table 27). 80% of the participants accept the transcendent nature of God and God awareness is a spiritual experience (table 26). Spiritual experiences are those experiences of sacredness which teachs the fundamental things about life and universe. (Yatiswarananda, 1998:526).

The objective of this research study is designed to test the hypothesis that the meditative *Sangeetham* of Tyagaya can produce an unique emotional response in the brain and thus connect to a higher "God Consciousness" or Brahmam Consciousness.

The survey findings (Table 37) denoted a good scientific recognition of God as a brain product and 78.8% of the respondents agreed that their interest in the God centre in the brain will accelerate. The Indian society believes on the divine nature of *sangeetham*. The Indian devotional musicological (*sangeetham*) treatises incorporate the theory of sacred sound as *Nada-Brahman* (holy). Thus, interpreting that devotional *sangeetham* (music) as a spiritual practice manifests a 'God Form" experience. This study explores what Saint Tyagaya *sangeetham* can teach about the brain and spirituality. The overall survey findings indicate positive relevance to Swami Tyagaya's musical compositions and its association to the brain mechanism. and therefore provides an access to the highest spiritual reality. God and spirituality are the most fascinating human experience to explore. Prominent scientists and researchers in U.S., Canada, Europe and India are endeavouring to understand the spiritual experience and its dynamics in the brain of those who connect with the divine spirit. They have made extensive researches with EEGs, fMRI, PET and other important investigatory tools. Dr Newberg, a famous neuro-psychologist says," If you contemplate God long enough, something surprising happens in the brain (Newberg, 2010:1). "Devotional singing like meditation and contemplation of God for long enough can cause different neural circuits in the brain to become activated and new neurons and synaptic connections are activated in the brain and God becomes neurologically real" (Newberg,2010:1).

The stastic validates the relationship of Tyagaya with his Ishta Deva to the statement with 78.8% of the respondents felt interest in the God centre in the brain. The EEG unfolds the dynamics of the brain in association with devotional *sangeetham*. The evaluation of the findings denote that the decision is appropriate

to the third objective of the study that modern Neuro-Psychology illustrates this "God- Image" in the brain which can be studied through the EEG experimentation.

5.4.7.4 Spirituality (Table 38)

The discussion about spirituality explains the fourth statement, "I trust that these questions may motivate you towards Spirituality". In Table 38, the findings denote that 81% of the respondents are motivated towards spirituality and 18.5% felt otherwise. Spirituality is a great feeling in the body, mind and soul. It works to be gentle, kind, loving and good. There is a general feeling of compassion, righteousness tolerance, decent morality and altruism about spirituality. Spirituality has different meaning to different societies. Spirituality in Hindu philosophy is an individual experience of higher reality and is one's journey towards salvation, moksha and confluence of karma, bhakti and jnana (Swami Yatiswarananda,1998:607).

Many respondents of the survey feel that spirituality simply means an experience of some goodness that is connected to God. Many feel that spirituality and love of God is natural and cannot be denied. Swami Tyagaya's spirituality advocates a overwhelming feeling of compassion for the fellow human being. His method of transformation is through singing constantly devotional compositions of love and admiration as the defining element in his spirituality. He says that spiruality is a mental and emotional quality and it is a single most important factor for mankind. The findings indicate that 49% agree that Swami Tyagaya's compositions infuse, spirituality, faith and compassion. The findings indicate that 46.6% agree that God is a mental image. 83.4% agree that the brain has attraction for music.

75.9% agree that spiritual feeling is related to God feeling. The survey expresses high degree of motivation towards spiritual sentiments as a Godly experience.

Spirituality has different implication in different situation. Modern spirituality is centered on moral personality and personal well-being, such as righteousness, compassion, forgiveness, love, patience, tolerance and altruistic values (Swami Yatiswarananda, 1998:303). Spiritual practices in the Vedantic tradition implicates in purifying the human mind and its action. Salvation is the highest goal for attaining perfection and enlightenment. The spiritual practitioner should perform various personal, religious and ritual disciplines to attain the spiritual goal. To attain a high level of spiritual success, a repeated practice is expected. (Swami Yatiswarananda, 1998:319). Patanjali's in his Yoga sutra book, recommends meditation in addition to *Karma yoga*, *Bhakti yoga*, *Jnana yoga* and *Raja yoga* (abid). The spiritual sadhana culminates in inner peace and happiness (Swami Yatiswarananda, 1998:303, 397). The review of the literature Swami Tyagaya by Prof Sambamurthy explains the greatness of Swami Tyagaya's spirituality, devotional *sangeetham* and psychology. Science and philosophy have contributed profoundly to human understanding of the concept of God and spirituality. Religion, Science and psychology can lead humanity to the spiritual goal of Swami Tyagaya. Humanity should place much importance towards high moral and spiritual standards in day to day activities. Humanity owes a great deal to saints for their spiritual guidence.

The statistics indicates that 81% of the respondents are motivated towards spirituality. The evaluation appropriately validates the fourth objective of the current

study in demonstrating the benefit of spirituality to the society and how to attain spiritual status.

5.4.7.5. **Love and Compassion** (Table 39)

The discussion of spirituality explains about love, compassion, equality and tolerance The fifth findings, "I envisage that these questions may encourage you to reflect on compassion and practice tolerance towards all life forms" yielded encouraging results, (Table 32). The findings denote that 83.4% of the respondents felt that they were encouraged to practice compassion and tolerance. The findings indicate the society's perception on devotional music and its spiritual manifestations in the form of love, compassion and tolerance and how they relate to life. This study rationalizes the spiritual experience through scientific explanations.

Swami Tyagaya portraits Lord Rama as noble, reighteous and compassionate in all his kritis. His fascinating narration in poems have delighted and enlightened many generations. Lord Rama's spiritual insight towards all life forms are relevant in today's troubled world. Tyagaya says, "Rama is dwelling in my heart. I have seen my Lord. My body is thrilled and tears of joy roll down my cheeks with the expression of love, compassion and spirituality (Ramanujachari, 1958:574). The comprehension of Swami Tayagaya's devotional *sangeetham* from the perspective of God , Lord Rama is spirituality. Divine love and compassion suffuse in every aspect of his utterance. His divine compossions celebrates the beauty of rightoeoussness and devotion.

The energy of love and compassion embraces mankind. The warm spirit of kindness unifies the whole society and the people at large. The great saints of the

world transmit much love and compassion. Like Swami Tyagaya, many saints around the world have mentioned of their vision of God. Neuro-scientist have recorded the God experience in their researches. The God experience is as a result of neuroplasticity in the brain. Dr Newberg says, "Today, our frontal lobes continue to envision spiritual realities, along weith new ideas and definition of God and different brains, in different parts of the world, create different religious beliefs" (Newberg, 2010:116).

The practise of devotional music can help the human society to be loving, tolerant, righteous and compassionate. Devotional singing is a meditative yoga which is a contemplation on God. Saint Tyagaya was a Yogi and he led a righteous and pious life. He devoted his life singing on Lord Rama. The brain of devotional singers when focus on the 'God image' for a long period of time can bring neuro-plasticity (growth), neocortical development and emotional changes. Society is slowly drifting away from one another as a result of diverse expressions. It is time to ignore the prophets of doom who daily forecast our inevitable demise. Humanity must take a quantum leap forward from this decadent development and change towards spirituality and righteous life. Devotional music activates a spiritual union with consciousness. Devotional *sangeetham* in general is love and harmony. Human beings are the most successful species the world has ever known and hence there is definite likelihood they will accept devotional music in their lives and promote love, compassion and tolerance. Mankind need to enjoy devotional music and employ it as a loving vehicle to propagate love, devotion and peace. Swami Tyagaya says, "God envelopes the whole world with love" (Ramanuchachari, 1958:573).

Devotional music involves emotions and emotions are powerful energy which governs a wide variety of activities involved with consciousness, empathy, compassion, suppression of anger and fear (Newberg, 2009:28). It is clear that devotional *sangeetham* can teach us more about the brain and the Brain can teach us more of spirituality. The literature study on devotional *sangeetham*, Swami Tyagaya, God, spirituality and neuro-psychology will provide new insights into the methods of mental and spiritual training that have potentials to enhance human health and religious tolerance. Equally important is the ability to cultivate compassion and other positive human qualities so that an ethical foundation is laid to benefit all human societies.

The discussion demonstrates how the statastic validates the elevated amount of acceptance towards kindness and love to all life forms. The findings denote that 83.4 % of the respondents feel that they are encouraged to practice compassion and tolerance. The decision is appropriate to the fourth objective of the thesis that demonstrates how to attain this spiritual status and what is the benefit of spirituality to the society.

Conclusion

The overall conclusion of the perception of Swami Tyagaya, devotional *sangeetham*, God, brain and spirituality denotes that 70.2% of the respondents agree that their involement in *sangeetham* and Swami Tyagaya's composition will increase their interest. 78.8% of the respondents are inspired to devotional music. 78.8% of the respondents feel that their interest in the God centre in the brain will accelerate. 81 % of the respondents are motivated towards spirituality. 83.4% of the

respondents are encouraged to practice compassion and tolerance. Logistic perception is that the local society believes in God, devotional music, Swami Tyagaya's spiritual experiences and the brain science. The total evaluation fulfills the first, second and fourth objective of the current study.

5.5 Comparative study of Dr Newberg's survey with the researcher's survey

A comparative analogy is made between the researcher's questionnaire survey to that of Dr Newberg's survey on spirituality. The goal of this endeavour is to report similarities and dissimilarities of religio-spiritual views. The evaluation is purely theoretical and views are subjected to change. The comparative information presented here may assist to understand devotional music, spirituality, life and God science.

In the year 2005, Newberg conducted a survey on 1000 people through online questionnaire of their spiritual experiences. In 2007 sufficient information were gathered from 300 who described their specific spiritual experiences. The people were from USA, Israel, Pakistan, India, Myanmar, Finland, Canada, the United Kingdom, Spain, Australia, Nigeria, Brazil, Denmark, Qatar and the Congo (Newberg, 2010:70). The researcher conducted a questionnaire survey. There were 410 respondents from the Indian society. The survey was for better comprehension of Swami Tyagaya's devotional compositions, *sangeetham*, God, neuro-psychology and spirituality. The experiences were compared for common terminologies like God, spirituality, experience, life and faith so on.

1. **Newberg Survey (NS):** God was only mentioned 18% of the time. (NS) 89% of the respondents felt a deeper sense of spirituality. 10 percent felt that their

spirituality was unchanged by their experiences. 79% said that they felt more purpose in their lives. 60% of the participants felt that their family relationships improved as a result of their spiritual experiences. 50% felt that their health enhanced due to their spiritual exercises. 76% felt less fear about death as a result of their spiritual experiences. Spiritual experiences may be the key element that lessens a person's fear of death. Love was mentioned 10% of the time. Peace was mentioned 6%. Faith was mentioned 5% of the time (Newberg, 2010:72). Many people felt that their spiritual experiences were not adequately taught by their own religion and therefore they lived individually without faith. Many expressed great interest in Eastern spiritual ideas and took up to meditation.

The Researcher Survey (RS): The main findings of the survey infer that 97.3% overwhelmingly believe in God and 83.9% agree that God is necessary. The findings indicate that 75.9% agree that spiritual feeling is related to God feeling and 90 % agree that meditation improve spiritual feelings. 79.3% agree that repeated meditation singing or chanting activate the brain and 83.4% agree that the brain has attraction for *sangeetham*. 69.5% agree that faith is required to love God.

The statistical percentage stand as evidence to prove that there were similarities in spiritual opinion and disimilarities in the concept of God between Eastern and Western societies.

2. **Newberg Survey (NS):** "Is God primarily a feeling or an idea". There were 1,000 references made about God; 1% of the respondents felt that they had a direct, personal encounter with God. 42% related to direct personal experiences and 99% expressed their experience as abstract. 40% explained God intellectually. They used words like ecstatic, exciting, great, strong, powerful, exhilarating, and profound. Nearly one-half described their experiences using words that expressed calmness, serenity, and contentment. Some experience God as more of a feeling than an idea (Newberg, 2010:84).

The Researcher Survey (RS): 56.9% agree that there is a God spot in the brain and 68.5% agree that God thought is a creation of one's brain and 68.5% agree that Saints can communicate with God. 68.5% agree that God thought is a creation of one's brain. 90% agree that meditation improve spiritual feelings and 79.3% agree that repeated meditation singing or chanting activate the brain.

i. 88.2% of the respondents positively agreed in the existence of God.
ii. 82.7% respondents meant that God experience is simply an experience that was out of the ordinary while some meant it as a deep, moving, mind altering experience.
iii. 68.5% respondents had an overwhelming feeling that consciousness was connected to the brain sense.
vi. 80% of the people felt that spirituality was knowledge that there is a true God.

The statistical percentage stand as evidence to prove that there were contrast in spiritual opinion the local society denoted a higher evaluation on God, meditation and saints. The similarities were close in the concept of spirituality between Eastern and Western societies.

3. **Newberg Survey (NS):** "Becoming one with God". 80% of the respondents felt that the spiritual experience increases their sense of unity to God and changes their sense of reality. It is an experience of self-transcendence and a suspension of personal egotism (Newberg, 2010:90).

   The Researcher Survey (RS): 75.9% agree that spiritual feeling is related to God feeling. 80% of the participants meant that the transcendent nature of the God experience was "spiritual meditation". 81% felt that spirituality means that which goes beyond personality and the space and time location where individual consciousness seems to reside. Spirituality concerns the foundations of an interactions between life, matter, nature, reality, time, space, consciousness, divinity and Humanity.

The statistical evidence prove that there are close similarities in the values of both the findings of the Eastern and Western societies.

4. **Newberg Survey (NS):** 80% said that they had some form of sensory, visual, or auditory experience. People described seeing light, colors, or auras; hearing sounds like humming or ringing; or hearing voices. These sensations greatly enhanced the power and meaning of their experience. Some have confessed that

during meditation, they have experienced their consciousness suspended in infinite space. Some have had the experience of unity with all that around. Some have experienced a Divine presence (Newberg, 2010:88).

The Researcher Survey (RS): 86.4% consider singing devotional songs as a meditational exercise to the brain. 90.3% would consider singing to devotional music important. 88.5% like listening to devotional music. 75.2% enjoy listening to Carnatic *Sangeetham*. 75.9% agree that spiritual feeling is related to God feeling.

The statistical percentage of both the surveys identifies similatites on intelectual experience of God. The local society denoted a higher evaluation on devotional *sangeetham*, God and meditation.

5. **Newberg Survey (NS):** The survey showed that those engaged in Eastern spiritual practices were more accepting of other religious beliefs than those who adhered to Western monotheistic traditions. Women were more comfortable with other belief systems and also more likely to participate in other religious practices.High socioeconomic status shows greater tolerance. Education encouraged people to be more accepting of others and people who had unity experiences were also more accepting of other people's beliefs (Newberg, 2010:82).

The Researcher Survey (RS): The female participants were more, 64.9%. There were a good mixture of young and old people. A high proportion of the

participants were college educated, 76%,and they were musicians, religious people, professionals and students. 86.8% of the participants were from the middle income catogery.

The most participants were Females which was 64.9% and 35.1% were males .The most participants belong to the age of 20-29 years old 38%; the next 30-39 years old 19.8% and 60 years old and above were 13.9%. The most participants were employed as Professional 49.5%; College studens 29.8%; Not working 5.4% and retired 4.9%. The most participants had Tertiary Education 76.3% and Secondary Education 19.8%. In the participants Family status Single were 46.3 %; Married+Children 31.2 % and Married 19.8%. In the socio-economic income 86.8% belong to the middle class and upper class 9%.

6. **Newberg Survey (NS):** 75% of the respondents indicated that they felt a sense of oneness with the universe and a unity with all of life. One survey participants described that every person is a spark of Oneness, doing what he or she is supposed to do. It is due to the subjective spiritual experience that increases the sense of unity to the universe and to creation as such (Newberg, 2010:81).

The Researcher Survey (RS): Some people felt that neuro-science is knowledge that there is no God vision but many respondents felt quite the reverse. 75.9% felt that neuro-psychology is getting in touch with God or a supreme emotion from the brain. 60% think that Brain is the most important factor to understand God; 70% judge that meditative thought is beneficial for spiritual study. 75% believe that religion motivates towards spirituality.

The statistical evidence prove that there were close similarities in the scientic rationalisation of in the conceptual dimension of God among the local and Western societies.

7. **Newberg Survey (NS):** explains that most people who have had spiritual experiences will talk about God in the context of love and peace. Most people expressed love as God. Many participants experienced God as a way of connecting to the universe and to nature. Some said that God symbolizes light or truth (Newberg, 2010:76).

   The Researcher Survey (RS): clarifies that 70.2% of the respondents agree that their involement in *sangeetham* and Swami Tyagaya's composition will increase their interest. 78.8% of the respondents were inspired to devotional music. 78.8% of the respondents felt that interest in the God centre in the brain will accelerate. 81% of the respondents felt that they may be motivated towards spirituality. 83.4% of the respondents felt that they were encouraged to practice compassion and tolerance.

The statistical percentages stand as evidence to prove that the local society overwhelmingly support devotional *sangeetham* of Swami Tyagaya having a profound influence in the brain. Newberg says that in the survey, many people reported that their spiritual experiences altered their beliefs, and belief was the sixth most common word used. He also found evidence to support the notion that spiritual experiences alter one's traditional ideas about God (Newberg, 2010:80). Spiritual

experiences can alter the structure of religion. Religious beliefs will change from time to time. Religion and spirituality influence one another but may function in different levels and they will eventually influence each other. Spirituality will advocate tolerance. All of the research allows the prediction about the future of God is that the concept of God is not going to go away but it may not be the God portrayed in the present scriptures. Belief in religion and holiness will change and evolve in relationship to society, environment and education. Therefore, spirituality, personal values and survival would change the concept of God. Personal spiritual philosophy will inspire greater tolerance between society and religions (Newberg, 2010:122).

Conclusion

The most important findings are that 80% of respondents believe God can be visualized through the consistent practice of devotional *sangeetham* which paves the way for the spiritual enlightenment. 80% of the respondents believe that devotional music motivate towards spirituality and 50% of them judge that Swami Tyagaya's *sangeetham* is beneficial for spiritual study. 60% of the respondents think that "God image" can be visualized in the brain. 87% of the respondents believe that the most important factor to understand God is to be righteous. 85% of the respondents feel that compassion and tolerance are important for life and 80% appreciate that faith in God is significant.

The researcher's obvious conclusion about the comparative findings is that there is not much of a fundamental differences in the application of spirituality in the form of love, tolerance, freedom and compassion but the difference appears in the understanding of God according to the respective beliefs and religion. The local

society overwhelmingly supported devotional *sangeetham* of Swami Tyagaya having a profound influence in the brain. God is a mental picture and is expressed as an experience. Women were more comfortable with *sangeetham* and God. High socioeconomic status shows greater tolerance. Education encouraged people to be more accepting of neuro-psychological thinking. Faith in Swami Tyagaya is stronger among women and *sangeetham* lovers, Those who believe in devotional charesteristics of Tyagopanishads are Indians and Carnatic musicians. Religion and spirituality influence one another. Spirituality advocates compassion, love and tolerance.

5.6 CONCLUSION OF THE QUESTIONNAIRE SURVEY

The summary of the eight sections of questionnaire survey segement illustrate the statistical relevance of the survey findings to the objective of the study and substantiates the merit of the study. The positive findings demonstates the value of Swami Tyagaya's devotional *sangeetham* towards spirituality and God science. The advance statistical analysis sucessfully provides subjective evidences on the values of Tyagaya's devotion and his vision of God, Lord Rama. The discussion overwhelmingly reports that devotional *sangeetham* has complex association with the brain network in relationship to God. The analysis amplifies positively the voices of the hundreds of volunteers who have come forward to tell their experiential views of *Sangeetham*, Swami Tyagaya, brain, devotion, God and spirituality (Tables 1 to 27). The statistical correlation of the major variables (Table 28) are significance for the creative power of Swami Tyagaya's *sangeetham*, for neuro-psychology of spirituality and experiential relevance of God.

The impacts of these factors have produced encouraging relevance to the subject of the study. The six Null Hypotheses are contested successfully and rejected by the findings of the six alternative hypotheses (Tables 29 to 34). The alternate findings show valuable affirmative correlation between *sangeetham*, devotional reliance, God, brain and spiritualism. These findings indicate that devotional *sangeetham* strongly influence the spiritual experience of the Indians.

It can be seen from the overall inference that the demographic and the statistical findings have helped to uncover and clarify the social, scientific and philosophical knowledge of the society on Swami Tyagaya, *sangeetham*, brain, devotion, spirituality and God. The findings illustrates the pattern and nature of devotion and identifies the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God". The overall logistic perception is that the society believes in God, devotional music, Swami Tyagaya's spiritual experiences and the brain science (Table 35 to 39). The subjective Survey findings contribute significantly to arrive at a favourable conclusion and prove that this study is properly substantiated. The discussion of the findings corroborates the validitity of all the four objectives of the study.

5.7 DISCUSSION ON THE FINDINGS OF EEG EXPERIMENTS

(Tables 40 - 55)

5.7.1 Introduction of the EEG Test

The introduction, physiology, procedure and the description of the EEG experiment are reported in Chapter Four (Tables 40 to 55). This kind of study on Swami Tyagaya's *sangeetham* and the brain has not been systematically explored

through the EEG. It is a noninvasive assessment of the brain activities. The electrical activity charecterises the emotional states in devotional singing applications and therefore, observe the different brain changes associated with long-term meditative singing and spiritual perception. The volunteers are represented as Group A, B, and C. The aim is to observe in Group A for changes in neurological parameters of while listening to Swami Tyagaya's devotional *sangeetham*. These findings are compared with the findings of Groups B and C who are the control group and who are listening to devotional songs (not Swami Tyagaya's *sangeetham*). The signals are correlated with the underlying changes associated with the mental response to meditational and Tyagaya's devotional singing. The EEG experiment investigates the feasibility of devotional Tyagaya's *sangeetham* as a self-regulatory approach to emotion management and God realization. The discussion evaluates the EEG changes in 3 groups of recruits.

Group A - Long-term Tyagaya Devotional Singers

Group B - Non Tyagaya Devotional Singers - Students

Group C - Non-Tyagaya Devotional Singers - Senior Citizens

The non-invasive assessment of the emotional states in Devotional *sangeetham* applications and the brain changes associated with long-term devotional *sangeetham*, meditative singing and spiritual perception are analysed.

5.7.2 Group A Findings and discussion (Table 42)

The EEG findings and discussion of Group A volunteers are important because they are exposed to the devotional *sangeetham* of Swami Tyagaya for a long

period of time and therefore certain brain changes are expected as a result of environmental conditioning of the brain. They are all familiar to Swami Tyagaya's *sangeetham*. They are all musicians, meditators and religious practitioners of more than 40 years experience.

i. The Alpha wave shows promising sign to the study. The inference is that since the Alpha activity is noticed in 100% of the volunteers in Group A in EEG 1, 2, 3 and 4 and also the Alpha activity is noticed in 100% in EEG 2 and 3 together (EEG 2 and 3 is an important stage where the 12 volunteers were already subjected to Swami Tyagaya's Devotional *sangeetham*). There is increase of alpha amplitude ranging from 50mv to 70mv and the alpha frequency is between 9hz to 11 hz. Therefore, in this group there is a predominance of Alpha activity. Alpha findings denote meditational state and relaxed brainwave activity. The important findings are that the Alpha waves are consistently seen.

   The Swami Tyagaya's devotional *sangeetham* volunteers are above 55 years old, semi-retired, professionals and classical musicians. The many years of behavioral development interacts with the brain devolpment. Therefore, the *sangeetham* background gives a stronger comprehension with Alpha waves dominance which are found when the brain is completely calm and meditating. They are relaxed, creative, and have a clear mind. Alpha is considered the "normal" brainwave pattern and is dominant when people close their eyes and contemplating. Alpha brainwaves are considered the healthiest brainwave range

and 10 cps has widely been accepted as the "safest" brainwave frequency. It is a natural signal especially in devotional *sangeetham* participation.

The Group A Alpha findings denotes meditational state and relaxed brain activity. Therefore, the influence of swami Tyagaya's *sangeetham* has produced 100% alpha activity in both the stages which denotes meditational brain state. The psychological understanding is that Swami Tyagaya's *sangeetham* environmental factor engages in the dynamics of brain to produce the relaxed Alpha brain waveform.

ii. The Beta wave often shows anxious thinking and active concentration which is important for the study. The inference is that Beta activity is noticed in 98% of the volunteers in EEG 1, 2, 3 and 4, and 96% in EEG 2 and 3 stages with a frequency of 18 cps and amplitude of 25 uv which is often associated with active thinking and energetic mental activity. Beta waves signals are dominant in logically thinking, feeling stressed, and feeling tense. Beta is generally thought of as a "normal" rhythm and is dominant in people who are alert, anxious, or have their eyes open. Beta brainwaves are considered to be the normal brainwave pattern in healthy adults. The brain naturally produces large amounts of Beta activity when it is active. In Group A, the Beta waves represents normal wave activity which is consistent in all active brains.

iii. The Theta wave indicates specific changes of consciousness. The evidence is that Theta activity is noticed in 68.75% of the volunteers in Group A in EEG1, 2, 3 and 4 and 83% in EEG 2 and 3 (EEG 2 &3 is an important stage where the 12 volunteers were already subjected to Swami Tyagaya's Devotional

sangeetham). The Theta wave activity is consistently seen throughout the four stages. The amplitude is 50 mv and the Theta frequency is 7 hz. The important findings is that in EEG 2, 3 and 4, there were 10, 10, 9 volunteers respectively who registered Theta waves after concentrating on Tyagaya's devotional *sangeetham* which indicates slowing of brain activity.

The inference is that in this group there is a predominance of Theta activity in 68.75% and 83%. 10 volunteers of EEG 2 and 10 volunteers of EEG 3 produced Theta activity of 7 cps of 50 uv amplitude which is a significant finding denoting change of consciousness. Theta waves tends to appear during meditative, drowsy, or sleeping states. Many volunteers confess that their devotional emotions were heightened and linked with very deep states of both physical and mental relaxation when listening to Swami Tyagaya's *sangeetham*. Since most of the volunteers in this group were musicians and religious teachers, they were easily associated to the emotional feelings of deep peace and calm. All the Group A volunteers find that their devotional emotions are heightened and linked with very deep states of both physical and mental relaxation when listening to Swami Tyagaya's *sangeetham*. Theta waves are associated to *sangeetham* lovers who are in meditative states.

The Theta wave creation is linked with a number of distinct mental states, such as feelings of deep relaxation, devotional wellbeing and creative insight, as well as the experience of altered states of consciousness. This emotional state probably is the cause for 83% Theta brainwaves of Group A volunteers.

iv. The Delta wave contribute to the slow state of the mind. The evidence is that Delta activity is noticed in 18.75% of the volunteers in Group A in EEG 1, 2, 3 and 4. Delta activity was noticed in 29% in EEG 2 and 3. The Delta waves are inconsistently seen in the recording. The delta frequencies is 4 hz and the amplitude is of 50 mv and. There is less dominance of delta activity and only 9 volunteers showed delta signals which denotes that they were in deep meditative state. The deep meditative state after listening to Swami Tyagaya's kritis probably was the cause for delta brainwaves. Delta brainwave states can occur in deep sleep and deep relaxation too. The Inference is that in Group A the Delta activity is as a result deep meditative state after listening to Swami Tyagaya's kritis.

v. The Group A background statistics findings is reported in (Table 43). The findings denote valuable assistance in assessing the long-term Tyagaya's devotional singing and spiritual perception and its close relationship to the EEG signals. The *sangeetham* behavioral factor influences the neural system of the brain. The brain activity is influenced by the environmental development.

The evidence is that all the volunteers answered overwhelmingly positive of their perception of God after listening to Saint Tyagaya's *sangeetham* which denotes 100%. Their average years they practised Singing Tyagaya's *kriti*s was 38 years, praying 38 years, reading Hindu scriptures 23, fasting 15 years, social service 22 and religious study 25 years. Their devotional emotions were heightened and linked with very deep states of both physical and mental relaxation. Their occupation of teaching. listening and contemplating on devotional Swami Tyagaya's composition

made them emotional and their perception were associated with feelings of Holiness and calmness.. They describe their experience as sacred.

The inference is that in Group A 100% alpha signals correlates with the behavioral pattern of the volunteers. The EEG signals of alpha and theta waves prove valuable for the meditative nature of this group.

The goal of devotional *sangeetham* practices is to increase the amount of slower brainwave patterns such as Alpha, Theta and Delta signals. It takes a rigorous amount of meditative and devotional practice to become consciously aware during the Alpha and Theta brainwave state. Experienced devotional singers know how to shift their brainwaves from the Beta range, through the pleasant calmness of Alpha and into the extraordinary Theta activity and eventually into the Delta range where the consciousness is slow. Experienced meditators will be able to recognize and control their state of emotion and the brain activity. Like any practice, the many years of devotional *sangeetham* will pave the way through the Alpha wave range, into Theta wave range and into the Delta brainwave rhythm which denotes a state of unconscious awareness whereby the brain activity is brought to almost stillness. Delta brainwave states usually occur in deep sleep. Infants and young children tend to have extremely high levels of Theta and Delta brainwaves compared to adults.

As it has been shown that the Group A volunteers are devotional musicians and therefore they are engaged in creative activity and naturally, they have produced more Alpha and Theta waves. Musicians, artists, yogis etc are more creative and are benefitted with Theta brainwave meditation. The subconscious mind is more easily

accessed during Theta meditation. This greater access to the subconscious has numerous benefits, including clearer intuition, getting in touch with the inner wisdom and the ability to program the "God Image" in the mind. Devotional *sangeetham* techniques can lead the brain to produce theta and alpha brainwaves as a type of yoga practice. Saint Tyagaya's devotional *sangeetham* is a form of meditation and yoga which promotes relaxation and wellbeing by shifting the brain activity to the calming patterns of Alpha, Theta, and sometimes Delta. The yogic phenomenon of Saint Tyagaya's devotional *sangeetham* when practiced correctly can be utilized to slow the brainwaves and tap the delta awareness. This awareness and insight can influence the "God image " in the brain as Swami Tyagaya did.

In Conclusion the *sangeetham* behavioral factor influences the neural system of the brain with the environmental development. The EEG findings points that Group A (Devotional Swami Tyagaya's *Sangeetham*) registered dominant Alpha, Theta and Delta activity. The volunteers find that their devotional emotions are heightened and linked with very deep states of both physical and mental relaxation. Since most of the volunteers in this group are musicians and religious teachers, their perception is associated with feelings of Holiness, peace and calmness. The act of listening and contemplating on Swami Tyagaya's devotional composition has brought emotional changes related to relaxed brain activity.

From the psychophysiological point of view these electroencephalographic findings lead to the conclusion that Swami Tyagaya's Devotional *Sangeetham* has a meditative consequence which designs to trigger the brain into producing Alpha, Theta and Delta signals. This values indicate that the devotional emotions of Swami

Tyagaya's kritis heightens to a deep state of mental relaxation to visualize "God". Visualization is an incredible tool that Swami Tyagaya experienced.

5.7.3 Group B Findings and discussion (Table 44)

The EEG findings and discussion of Group B volunteers are important because they are exposed to the devotional *sangeetham* exposed to the devotional songs of their choice (not Saint Tyagaya's *sangeetham*). They are all about 20 years of age and they are all University students. They have moderate interest in religion and devotional songs but have no knowledge of saint Tyagaya's *sangeetham*. The complete EEG findings are in Alpha, Beta Theta and Delta signals respectively.

i. The Alpha waves signifies valuable information for the study. Table 44. The evidence show that there is a predominance of Alpha activity in the full course of the EEG recording. The alpha amplitude ranging from 50mv to 70mv and the Alpha frequency are averaging at 10 hz. All the 12 volunteers are young students. The Alpha brainwaves are considered the healthiest brainwave range and is widely been accepted as the safe brainwave frequency. It is known that students tend to have much higher levels of alpha brainwaves than adults. Alpha waves are found when the mind and body are completely relaxed and free of stress. The devotional songs have caused the relaxed brainwave activity recording of 89% of the volunteers in in EEG 1, 2, 3 and 4 and 87% in EEG 2 and 3. which is impressive.

The inference is that Alpha brainwaves are considered common and are normal brainwave pattern in young adults. The contemplation of the religious songs has calmed the brain activity.

ii. The Beta waves are the common waves denoting active concentration. The confirmation is that the Beta activity was noticed in 89.75% of the volunteers in in EEG 1, 2, 3 and 4 and Beta activity was noticed in 92% in EEG 2 and 3. The Beta amplitude was of 25 mv and the Beta frequency were between 15 hz to 17 hz. The conclusion is Beta waves are common signals and consistently seen in all active individuals. Beta findings denote alertness, active thinking and energetic mental activity. The students active disposition has made increase brain activity for Beta signals.

iii. The Theta waves are uncommon waves in active individuals. The evidence is that the Theta activity is noticed in 43.5% of the volunteers in Group B in EEG 1, 2, 3 and 4. Stage EEG 2 and 3 recorded 53.5% with theta activity. The Theta frequency is between 6 hz to 7 hz and the amplitude of 50 mv. The conclusion is that Theta findings denote feelings of relaxation, devotional wellbeing and creative insight, as well as meditational experience. Theta waves tends to appear during the devotional state after listening to devotional songs or sleep state. All the volunteers are students and they could have had less interest for the devotional songs or they were not concentrating in the songs. Therefore, in this group there is a smaller amount of Theta activity of 43.55 and 53.5%.

iv. The Delta waves indicate very slow brain activity. The fact is that the Delta activity was noticed in 29% of the volunteers in Group B in EEG 1, 2, 3 and 4 .Delta activity was noticed in 33% in EEG 2 and 3. The delta frequencies were between 3 hz to 4 hz and the amplitude of 50 mv. The conclusion is that the devotional state after listening to devotional *kriti*s denotes the Delta brainwaves. Delta brainwave states usually occur in deep sleep and deep relaxation. Usually, young students and young children tend to have high levels of Theta and Delta brainwaves compared to adults. In this group there is less dominance of delta activity which denotes less meditative state of the brain which may mean that the influence of devotional sensation was less.

v. The Group B background statistics findings is reported in (Table 45). The findings denote valuable assistance in assessing the and spiritual perception and its relationship to the EEG signals. Generally, environmental factors influence the brain activity.The evidence is that all the volunteers answered 54% positive of their perception of God after listening to devotional songs. The answers were 26 positive and 22 negative. Their average age was 20 years old. The average years they practiced Singing religious songs was 6 years, reading Hindu scriptures 6 years, praying 14 years, fasting 4 years, social service 4 years and religious study 15 years..

The conclusion is that the students had less knowledge in their religion and therefore were not sure of their devotional emotions. The finding indicated some negative values which correlated to less meditative nature.

The overall discussion of Group B

The goal of the experiment is to show a relaxed brain activity when introduced to devotional songs. There were relatively active brain signals. The EEG signals showed, Theta activity 40%, Alpha activity 80%, Delta activity in 40% and Excessive Beta activity of 90%. The background study of the students volunteers indicated that their devotional emotions were weakly positive with God feeling. The act of listening and contemplating on devotional composition was less. There were some emotional changes but not remarkable.

This conclusion indicates an active brain pattern. The background findings correlated weakly to the EEG findings. Therefore, devotional emotions of Group B volunteers suggested a weak correlation.

From the psychophysiological point of view these electroencephalographic findings lead to the the conclusions that the Group B volunteers are students with dominant Beta and Alpha brainwave patterns which means active mental and physical capabilities. Students brain naturally produces large amounts of Beta activity. It could mean that devotional music has probably not relaxed their brain sufficiently. The EEG data shows weak correlation to the objective of the study.

5.7.4 Group C Findings and discussion (Table 46)

The EEG findings and discussion of Group C volunteers are important because they are exposed to the devotional songs of their choice (Not Saint Tyagaya's *sangeetham*). The volunteers are all over 50 years of age and they are all officers and teachers. They have good interest in religion and devotional songs but have less

knowledge of saint Tyagaya's *sangeetham*. The complete EEG findings are in Alpha, Beta Theta and Delta signals respectively. The Four stage EEG and the The EEG 2 &3 findings are discussed.

i. The Alpha waves are essential for this study. The evidence shows that the Alpha activity was noticed in 90% of the volunteers in Group C in EEG 1, 2, 3 and 4. Alpha activity was noticed in 100% in EEG 2 and 3. (EEG 2 and 3 is an important stage where the 10 volunteers were already subjected to Devotional songs of their choice). There is a predominance of Alpha activity. The alpha frequency were averaging at 10 hz. In the full course of the recording there were increase of alpha amplitude ranging from 50 mv to 70 mv. The important findings are that the Alpha waves are consistently recorded in all leads. The alpha activity predominantly originates from the occipital lobe The 10 group C volunteers are adults with religious experience and they contemplated over the devotional songs with purpose. Alpha waves are found when the mind and body are completely relaxed and calm. Alpha findings denote meditational state and relaxed brainwave activity.

The important inference is that The devotional songs meditation have caused the relaxed brainwave activity recording of 90% and 100% Alpha activity which is impressive and is a dominant result. The psychological understanding is that devotional songs and occupational factor influences the brain activity to produce the relaxed Alpha brain waveform.

ii. The Beta waves are the common active waves. The evidence denotes that the Beta activity was noticed in 95% of the volunteers in Group C in EEG 1, 2, 3 and 4. Beta activity was noticed in 95% in EEG 2 and 3. Beta amplitude of 25 mv and the frequency were between 18 hz to 17 hz. There is a predominance of Beta activity and the waves are consistently seen in all leads. Beta activity is the most common brain signals.

The conclusion is that there is a dominance of Beta signals which denotes alertness, active thinking and energetic mental activity.

iii. The Theta waves are useful in relation to the consciousness with the underlying neurophysiology. The evidence shows that the Theta activity was noticed in 65% of the volunteers in Group C in EEG 1, 2, 3 and 4. Theta activity was noticed in 75% in EEG 2 and 3. (EEG 2 &3 is an important stage where the 10 volunteers were already subjected to devotional songs). Theta waves are consistently seen in all leads. There were consistent amplitude of 50 mv. The Theta frequency was between 6 hz to 7 hz. The findings are that in EEG 2, 3 & 4, there were 8,7,8 volunteers respectively who registered Theta waves after concentrating on devotional music which indicates slowing of brain activity.

The Group C has the second largest finding of theta activity. The meditational state after listening to devotional songs probably is the cause for more Theta brainwaves. Theta findings denote feelings of deep relaxation, devotional wellbeing and creative insight, as well as meditational experience. All the volunteers were teachers and professionals and their motivation was excellent

and therefore they were in deep state of meditation. The important findings in many volunteers are that their devotional emotions were heightened and linked with deep states of mental relaxation.

The conclusion is that in the Group C, the 65% and 75% Theta waves are associated with feelings of deep calmness and discipline. The neurophysiology impact of the devotional songs meditation has caused notable Theta brainwave activity which is an important verdict.

iv. The Delta waves are rarer and slower brain activity. The proof shows that the Delta activity was noticed in 5% of the volunteers in Group C in EEG 1, 2, 3 and 4. Delta activity was noticed in 5% in EEG 2 and 3. The delta amplitude was 50 mv and the frequency was between 3 hz and 1 hz. Therefore, only 2 volunteers showed delta activity. Delta signals signify deep meditative state after listening to devotioanal kritis and it can occur in deep sleep and deep relaxation. It is commonly found in infants and young children. Delta waves are found in some people who practice deep meditation.

The conclusion is that in Group C there is minimal dominance of delta activity.

v. The Group C background statistics findings is reported in (Table 47). The background findings denote valuable assistance in assessing the influence of devotional perception and its relationship to the EEG signals. The environmental factors influence the frame of the mind. The evidence shows that the volunteers are educated and religious people. They are teachers and

professionals. The average age was 58 years old. The average years they practiced Singing religious songs was 7 years, reading Hindu scriptures 10 years, praying 33 years, fasting 2 years, social service 18 years and religious study for 13 years. All the 10 volunteers answered the four questions of their perception of God after listening to devotional songs. overwhelmingly positive which denoted 100%.

The psychological conclusion is that the finding proved valuable for the meditative nature of this group and for the association of EEG experimentation.

The Overall Discussion of Group C

The goal of the experiment is to show a relaxed brain when introduced to devotional songs so that the EEG signals can show the meditative state of the brain. The literature says that the signals for calm brain are Alpha, Theta or Delta waves. A deep contemplation of devotional songs may shift the brain waves from the Beta range to the slower Alpha range. The signals reflect the tranquil nature of the brain.

The background findings of the 10 group C volunteers. They were educated and religious people. They were teachers and professionals The average age was 58 years old. The average years they practiced Singing religious songs was 7 years, reading Hindu scriptures 10 years, praying 33 years, fasting 2 years, social service 18 years and religious study 13 years. All the 10 volunteers answered the four questions overwhelmingly positive which denoted 100%. The finding is that all the 10 volunteers were emotional and described their experience as a divine emotion. These findings suggested a superlative correlation to the devotional emotions of

Group C volunteers which have heightened and linked with deep states of both physical and mental relaxation.

From the psychophysiological point of view these electroencephalographic findings lead to the conclusions that the EEG signals shows, 75% Theta activity, 100% Alpha activity, 5% Delta activity and excessive Beta activity of 95% . This findings indicate an active brain pattern. The background findings correlated strongly to the EEG findings.Therefore, the devotional emotions of Group C volunteers suggested a strong correlation to the Alpha and Theta EEG signals .

5.7..5 Discussion of Background Environmental Assessment of Group A, B and C (Table 48)

The background information evaluates the experience of the volunteer. It contributes significantly to the persons overall mental makeup. It is an environmental conditioning of the mind through varies activities. It is the knowledge acquired through their vocation. The process of singing and understanding the language creates an experience. Experience is a brain condition. The devotional experience of singing Swami Tyagaya's *sangeetham* conditions the brain to understand the fundamental nature of reality and its philosophy. The experiential learning is the process of understanding through familiarity of experience based activities. The brain cell network changes as a result of experiential environment. It is a neurobiological explanation which accounts for brain development and its periodic changes. Inherited factors and environmental factors interact constantly in the ever-changing brain cells.

The intrinsic genetic factors and extrinsic psychological dynamics support one another in brain development. The external developmental processes initiates particular structural changes of the brain through neural plasticity. Dr Joan Stiles is clear in her objective to provide an overview of the fundamentals of brain development through behavioural experiences. She associates sciences to understand the biological under pinnings of thecomplex changes observed in perceptual, cognitive, affective and social development (Joan Stiles, 2008:440). The development of the brain is a life-long process. Indeed, recent research suggests that the brain is capable of changing throughout the lifespan. The constant experience and the familiar knowledge influence the development of specific brain centers such as auditory, visual, language, memory, sensory and motor.

The brain cells are tuned to the sounds of virtually all languages but with experience, their brains become most tuned to language. The plasticity of the brain underlies much of the learning that occurs during this period. The input from the environment modifies the neural networks (Levitin, 2006:196). A good quality experience gives rise to a good quality brain function. Therefore, the environment of devotional *sangeetham* promotes brain activity. The specfic brain arrears gets activated to produce emotions and visions. Swami Tyagaya was a religious man life long and he inherited his background as a fundamental reality. The development of the biological and environmental knowledge is the reason for Swami Tygaya to envision Lord Rama.

Neurosciences can shed light to human psychology. Much of brain research is descriptive and simply tells us how the brain contributes to the development of

behavior. This study on devotional *sangeetham* and music research has implications on the decision of the brain activity. Dr Patel a leading cognitive scientist states, "one well studied case is that of Indian cassical music, in which different *ragas*, charecterized by pericular scales, tonal hierarchy and melodic gestures claim to express different charecteristic moods, *'rasas'* which ia judgement of emotion produced in the brain" (Aniruddh Patel, 2008:313). Swami Tyagaya's *sangeetham and sahityam* (language) initiates deep and critical connections to the neural mechanisms in the brain. The external resources organize differently to shape the brain areas. Melody, rythym, beats and movements play important role in neuroplasticity. Language engages the language centres of the brain and organize the knowledge. *Sangeetham* experience as an input shapes the basic need of the brain and gives expression to the effort. The environmental experience is flexible and dynamic in shaping the brain to envision the image of God.

A comparative assessment is made to learn about the influence of *sangeetham* on the volunteers. Group A, B and C background assessment is the process by which the researcher identifies the volunteers *sangeetham* knowledge, devotion, experience of life pertaining to their mental health and spiritual needs. The determination of spiritual needs and resources helps in assessing the quality of the candidates. The evaluation of the impact over their beliefs help in the assessment of the quality of the EEG electrical signals. Their knowledge and their devotion promotes their spiritual resources. The background finding corroborates to thespiritual outcome. The Group A volunteers have the environmental influence of *Sangeetham* for many years. Generally devotional *sangeetham* have meditative implication which designs to trigger the brain into producing Alpha, Theta and Delta state.

The devotional emotions are heightened and linked with very deep states of both physical and mental relaxation. The background knowledge authenticates a superlative correlation to the devotional emotions which have heightened and linked with deep states of both physical and mental relaxation. The strong subjective background correlation can reflect strongly to the objective EEG findings. The Group A volunteers are deeply involved with *sangeetham* and prayers for a long period of time which creates a positive setting for the brain wave modulation.Their advance age and family status and *sangeetham* experience is the cause for the high EEG signal valuation. Both the Group A and Group C volunteers had identical answers for the four questions which denotes 100% respectively. The finding is that all the volunteers of Group A and C are emotional and describe their experience as a divine emotion. The issue of belief in God is 100% positive in both the groups.

The finding proved valuable for the meditative nature of Group A & C. Group A's experience of religious practice is more in comparison to the Group C and Group B. The Group C volunteers experience indicates values for a second place and while Group B student volunteers are a distant third.(Table 48). The results point out that Group A with Tyagaya's devotional *Sangeetham* environment has a efficient brain state which designs to trigger the brain into producing more of Alpha, Theta and Delta waveforms. The background findings of Group A suggest a superlative correlation to the devotional emotions which have heightened and linked with deep states of mental relaxation or a meditative state. Their extrinsic environmental knowledge and their intrinsic brain cells promote their spiritual resources.

The conclusion is that Group A volunteers have a higher level of experience with Swami Tyagaya's *sangeetham* and therefore they have a predominance in all the spiritual departments. Group C has a lesser prevalence than Group A and Group B is a distant third in all spiritual relationships and *sangeetham* experience. *Sangeetham* experience as an input shapes the basic need of the brain and gives better spiritual knowledge and expression.

5.7.6 General Discussion of the Brain signals of Group A, B, and C.

(Table 49 - 54)

The discussion is based on the findings of the EEG investigation which will assist in the correlation of Divine emotions during singing of Swami Tyagaya's Carnatic *sangeetham* or listening to devotional music. This study applies EEG algorithms on Group A of 12 volunteers to demonstrate the feasibility of Swami Tyagaya's devotiona *sangeetham* in the attainment of divine emotion as a self-regulatory approach to emotion management and God realization. (Swami Tyagaya attained moksha).

The Group A results are compared against another 2 control groups of Group B of 12 volunteers and Group C of 10 volunteers. The 34 voluneers are recruited as part of an ongoing study of the brain using the International 10 - 20 System, EEG. The researcher evaluates the EEG changes in the 3 groups and the discussion will be based on the results which are represented in the tables with the number of candidates and percentage values. The comparative values indicates the percentage of the signals.The findings are reported in three stage of A,B and C. The overall EEG finding reported under Group A will show the different electrical signal patterns from

the brain as advance objective evidences on the values of Tyagaya's devotional *sangeetham* and the brain. The overall EEG finding reported under Group B and C will show the different signals from the brain as evidences on the values of devotional songs and the brain (not Tyagaya's *sangeetham*). The tests shows the individual brain electrical activities as Alpha, Beta, Theta and Delta Waves with the percentage, the frequency and the amplitude. In order to understand the EEG signals, the discussion is divided in three sections for easy orientation.

i. Individual Evaluation (Table 49 - 52)
ii. EEG 1 2 3 and 4 Evaluation (Table 53)
ii. EEG 2 and 3 Evaluation (Table 54)

i. The Individual Evaluation

The EEG signals are displayed in the form of statistical average percentage.The description shows the relationship and the variance of the EEG waveforms. The report is based on visual detection of the waveforms on the graph. The findings are represented in percentage, frequency and amplitude. The tables show the comparative signals for quick reference.

Table 49: The Alpha signals denotes the overall percentage and the average frequency and average amplitude of Group A, B and C. The three groups show high percentage of Alpha activity which relates to thoughtful slow brain activity. The normal Alpha range is 8 to 12Hz.

Group A : Total EEG 1 to 4 - 100% volunteers with alpha activity with average of 10.25 cps and amplitude of 55 mv

Group B : EEG 1 to 4 - 89.5% volunteers with alpha activity with average of 10 cps and amplitude of 50 mv

Group C : EEG1 to 4 - 90% volunteers with alpha activity with average of 10 cps and amplitude of 55 mv

The Group A volunteers show 100% Alpha activity. Alpha wave activity means that the brain is in a relaxed state and awake. Alpha waves are present when practicing mindfulness or meditation. The amplitude is 55mv. It occurs with a average rhythm of 10.25 cycles per second (Hz), It is best measured in the occipital region of the brain, which is located at the back of the head. The inference is that the Group A seemingly exhibit relaxed or reflective mental action to Swami Tyagaya's *sangeetham*. The Alpha signal is associated to the closing the eyes and inhibition brain control.

Table 50: The Beta signals denote the overall percentage and the average frequency and average amplitude of Group A, B and C. All the three groups show high percentage of Beta waves which denotes active brain. The normal Beta range is 13 to 30 Hz.

Group A : Total EEG 1 to 4 - 98% volunteers with beta activity with average of 17.5 cps and amplitude of 25 mv

Group B : EEG 1 to 4 - 89.75% volunteers with beta activity with average of 15.75 cps and amplitude of 25mv;

Group C : Total EEG 1 to 4 - 95% volunteers with beta activity with average of 18.75 cps and amplitude of 25 mv

The Group A shows an average of 98% Beta signals with an amplitude of 25 mv and average of 17.5 cps.The Beta are the most common daytime brain waves. They are dominant during normal wakeful states and when focused on cognitive and other active tasks, such as problem solving or decision making. Inference is that the Group A, B and C volunteers are actively thinking, focused and highly alert with the procedure of listening to the *sangeetham* and understanding the language.

Table 51: The Theta signals shows the overall percentage and the average frequency and average amplitude. Theta waves signifies meditative brain. The normal range 4to 8cps.

Group A : EEG 1 to 4 - 68.75% volunteers with theta activity with average of 6.5 cps and amplitude of 50 mv

Group B : EEG 1 to 4 - 43.5% volunteers with theta activity with average of 6.75 cps and amplitude of 50 mv

Group C : EEG1 to 4 - 65% volunteers with theta activity with average of 6. 5 cps and amplitude of 50mv;

The Group A shows average of 68.75 Theta Waves with average of 6.5 cps and amplitude 50mv. The Group A and Group C shows high percentage of Theta waves which signifies meditative relaxed brain. The waves occurs during sleep, and have been observed in very deep states of meditation. The inference is that the Group A

volunteers are in deep contemplation of *sangeetham* associate with inhibition of anxiousness.

Table 52: The Delta signals indicates the overall percentage and the average frequency and average amplitude. The delta waves convey deep meditaion or drowsy sleepy state. The normal range is 0 to 4hz.

Group A : EEG1 to 4 - 18.75% volunteers with delta activity with average of 2.75 cps and amplitude of 50 mv

Group B : Total EEG1 to 4 - 29% volunteers with delta activity with average of 3.25 cps and amplitude of 50 mv

Group C : Total EEG 1 to 4 - 5% volunteers with delta activity with average of 1.5 cps and amplitude of 50mv

The Group B volunteers show an average of 29% of Delta waves and average of 3.25 cps frequency and an amplitude of 50 mv. Delta waves are the slowest brain waves and occur during the deepest states of sleep or meditation. The 18.75% registered by Group A could mean a deep state of meditation as a result of listening to Tyagaya's *sangeetham*. The inference is that Group B volunteers are students with an average age of 20 years. It may be associated with the deep stage sleep as a result of boredom.

The overall conclusion is that the Group A volunteers indicate a higher percentage of Alpha and Theta wave than group B and Group C. The Group C volunteers show a higher level of Theta waves than Group B. The Group A volunteers have higher

levels of Delta waves than Group B and Group C. The background influence of *sangeetham* and prayers in Group A creates a positive setting for the brain wave modulation. Their advance age and family status and *sangeetham* experience is probably the cause for the high 100% Alpha waves and 68.75% Theta waves which remains as the proof to indicate the relaxed brain activity due to the stumuli of Swami Tyagaya's *sangeetham*.

ii. Discussion of the EEG 1, 2, 3, 4 tests and brain signals (Table 53)

In the present study, the EEG changes accompanied with the 3 groups of total 34 volunteers have been revealed and described in detail for EEG 1, 2, 3 and 4 tests. The comparative EEG signals are discussed in a different cross sectional perspective for a better understanding of the complex nature of the electrographic changes.The argument is based on the different brain waveform in relation to Tyagaya's *sangeetham* and the consciousness with its underlying neurophysiological background and comparing with that of the control groups. The brain waveform data mentioned below will illustrate the combined significance of the Alpha, Beta, Theta and the Delta signals. This is a summarized illustration of the comparative EEG 1,2,3&4 test for comparative understanding of the percentage of Alpha, Beta, Theta and Delta signals.

Alpha waves %

Alpha activity was noticed in 100% of the volunteers in Group A

Alpha activity was noticed in 89.5% of the volunteers in Group B

Alpha activity was noticed in 90% of the volunteers in Group C

Theta Waves

Theta activity was noticed in 68.75% of the volunteers in Group A

Theta activity was noticed in 43.5% of the volunteers in Group B

Theta activity was noticed in 65% of the volunteers in Group C

Delta waves

Delta activity was noticed in 18.75% of the volunteers in Group A

Delta activity was noticed in 29% of the volunteers in Group B

Delta activity was noticed in 5% of the volunteers in Group C

Beta Waves

Beta activity was noticed in 95.75% of the volunteers in Group A

Beta activity was noticed in 89.75% of the volunteers in Group B

Beta activity was noticed in 95% of the volunteers in Group C

The results of EEG 1, 2, 3 and 4 tests denotes that the Group A signals are 100% Alpha and 68.75% Theta waves which indicates a higher percentageof Alpha and Theta waves than group B and Group C. It proves that Group A who are deeply involved with *sangeetham* creates a relaxed brain activity. The Group C signals show a high level of 90% Alpha and 65% Theta waves. It proves that even the devotional song experience can cause the relaxed brain signals. Group B shows a relatively poor brain signals than Group A. The long-term *sangeetham* practice of Group A facilitates a relaxed effect in the brain which creates alterations in the brain activities during the act of meditational *sangeetham* singing. The EEG has played a useful role in this study as a primary method for evaluating the meditating brain. In these three

groups the appearance of Theta and Alpha waves play a leading role for the inference of the changes in the brain during and after listening to *sangeetham* and devotional music. These Theta, Beta, Delta and Alpha waves continues to appear, and their amplitudes increases as the session of *sangeetham* contemplation progresses.

The 100% Alpha frequency in Group A and 90% Alpha frequency in Group C and 89.5% Alpha in Group B indicates good relaxed mental outcome. Further 68.75 Theta waves with low frequency and high amplitude was observed in Group A volunteers which indicates superior meditative mental outcome. It is noticed that in Group A and Group C, the EEG changes are related with the volunteer's relaxed mental state. Incidently, the mental state is evaluated by the background questionnaire survey data also. These EEG changes with the the appearance of Alpha waves and increase of alpha amplitude and appearance of Theta waves and increase of high amplitude paves well for the change of mental state. The value of increase frequency and amplitude of Theta waves and the presence of Delta waves all denote valuable information on the status of the relaxed brain activity. Thus in Group A, the Alpha, Theta and Delta activating pattern indicates the augmented level of consciousness and its regulation of the inner mind. It will be, therefore, expected that Swami Tyagaya *sangeetham* and meditation will bring about the relax pattern of the Alpha and Theta signals. Many studies on meditation, have linked lower frequency Alpha and high amplitude Theta waves to relaxed brain activities.These electrographic changes were also compared with that of the values of the studies done by Akira Kasamatsu and Tomio Hiraim, "An Electroencephalographic Study on the Zen meditation" and there were similarities to the Alpha and Theta brainwave activities (Psychiatrica et Neurologica, No 4, Vol 20:331).

In conclusion the researcher believes that Swami Tyagaya's *sangeetham* indicates greater sensitivity to emotional expression and therefore this devotional sensation creates calm brain cell activation. This emotional neuro-psychological consequence is responsible for the visualization of 'God' which Swami Tyagaya experienced and noted in his kritis. Therefore, Swami Tyagaya's *sangeetham* is a spiritual exercise which has a spiritual association. The consistent devotion and regular training of Tyagaya's *sangeetham* produces meditational effect in the brain which is significant for sacred experiences. The spiritual experiences evolves to encounter with God or contacts with higher relalities which are not ordinary happenings. This kind of mystical religious encounters are evolved experience of human brain which is amenable for scientific study. Thus, the influence of Tyagaya's *sangeetham* is of interest to scientific studies, from the stand point of theology, psychology and neuro-physiology.

iii. A Comparative Discussion of EEG 2&3 and EEG 1, 2, 3 and 4. brain signals (Table 54)

The researcher discusses further from a different perspective the electrographic changes of EEG 2 and 3 in relation to Group A (Tyagaya's *sangeetham*) and comparing with the brain signals of EEG 1, 2, 3 and 4 and about its underlying neurophysiological changes of Group B and C. The EEG finding of stage 2 and 3 reported will show the different electrical signal patterns from the brain after 15minutes and 30 minutes of concentration of Tyagaya's Devotional *sangeetham* for Group A only and devotional song for Group B &C respectively. A summarized illustration of the comparative EEG 2 and 3 signals are mentioned for easy understanding of the percentage of Alpha, Beta, Theta and Delta signals.

Alpha waves

Alpha activity was noticed in 100% of the volunteers in Group A

Alpha activity was noticed in 89.5% of the volunteers in Group B

Alpha activity was noticed in 100% of the volunteers in Group C

Theta Waves

Theta activity was noticed in 83% of the volunteers in Group A

Theta activity was noticed in 53.5% of the volunteers in Group B

Theta activity was noticed in 75% of the volunteers in Group C

Delta waves

Delta activity was noticed in 29 % of the volunteers in Group A

Delta activity was noticed in 3% of the volunteers in Group B

Delta activity was noticed in 5% of the volunteers in Group C

Beta waves

Beta activity was noticed in 96 % of the volunteers in Group A

Beta activity was noticed in 92% of the volunteers in Group B

Beta activity was noticed in 95% of the volunteers in Group C

In the two stage EEG of 2 and 3, the Group A indicate a higher percentage of Alpha, Theta and Delta waves than group B and Group C. The emotional response which is activated after 15 minutes of listening is recorded as brain signals. The Group A, the Alpha and Theta values of Table 53 and Table 54 shows highest values in comparison to Group B and C. This high percentage of Alpha and Theta values of

Group A in all the three stages indicate that Swami Tyagaya's *sangeetham* creates a greater sensitivity to emotional expression of the contemplating brain to envision God due to the experiential *sangeetham* influence.

In Group A, 100% volunteers with Alpha activity with average of 10 cps and amplitude of 50Mv is seen and Theta activity is noticed in 83% with 7 cps and 50 Mv and Delta activity was noticed in 29% with 3cps and 50 Mv aplitude. It is recorded that during deep meditation the Delta brainwaves must travel through Alpha and Theta waves to be able to connect with deeper parts of the unconscious mind stage. However the experiment result show that from the electroencephalographic point of view, the comparative changes of Theta and Alpha waves are more in Group A when compared to the control Groups B and C. The hypnotic changes during Tyagaya's *sangeetham* are more persistent and did not turn into deeper sleep pattern and the Theta signals are marked and Alpha signals are pronounced. In group B and C, the Beta, Alpha and Theta signals are fairly consistant but of lower percentage. The high percentage presence of Alpha & Theta waves are significant to consider the neurophysiological changes of the mental state during Tyagaya's *sangeetham*. These results confirms that in Group A, Swami Tyagaya's *sangeetham* stimulates a form of meditation or mental calmness.

In a comparative analysis, the Group A, EEG 1, 2, 3 and 4 denotes 100% Alpha and 68.75% Theta waves and EEG 2 and 3 denotes 100% Alpha and 83% Theta waves. The Group C, EEG 1, 2, 3 and 4 indicates 90% Alpha and 65% Theta and EEG 2 and 3, Alpha 100% and Theta 75%. The Group B, EEG 1, 2, 3 and 4 shows Alpha 89.5% and Theta 43.5% and EEG 2 and 3 shows Alpha 89.5% and

Theta 53.5%. From the electroencephalographic point of view, the comparative percentage of Theta and Alpha waves are more in Group A when compared to the control Groups B and C. Group B indicated a higher percentage than Group B. From the psychological point of view, it is observed that the Swami Tyagaya *sangeetham* and devotional songs both bring about the meditative changes of consciousness in the brain. Identical observations are reported by Akira Kasamatsu on the meditative changes of consciousness (Akira Kasamatsu, 1966:332).

These electroencephalographic signals lead to the following conclusions from the comparative study of the multiple approach discussion. The Group A of Tyagaya's *sangeetham* produces the slowing of brain electrical activity which denotes through Alpha, Delta and Theta signals. The pilot Group A has a better percentage to the control Group B and Group C. The control Group C has a better percentage to Group B. Therefore, all the Groups A, B and C did indicate specific changes of consciousness and slowing of the brain activity. From a psychological point of view, Swami Tyagaya's *Sangeetham* has a positive indication to elevate consciousness and spiritual values. The reference article by Dr Sundarachari et al, mentions that in their study during the state of meditation, it showed persistent Alpha activity wave pattern compared to the control group and there was a preponderance of Alpha waves in yogis (Sundrachari, 2013:55).

It is apparent that in Group A the brain signals shows a larger percentage of Alpha, Theta, and Delta brain waves. The theta waves are usually related to deep meditation or contemplation or dream state and Theta waves operate at a rate of between 4-8 Hz. The Group A volunteers are associated with emotional surges,

intuitiveness, imagination and spiritual experiences through Tyagaya's *sangeetham*. The healthy neurotransmitters that we need, such as seratonin, melatonin, dopamine are responsible for the well being and peacefulness (Newberg, 2010:159). The Delta waves are the slower signals and are present in deep meditation and deep sleep. Delta waves operate at a rate of between 0-4 Hz. The alpha waves are slower than the beta waves and is associated with meditation and calmness. Alpha waves operate at a rate of 8-12 Hz. These three waves are high amplitude waves and low frequency waves. Theta and Delta brain waves are most commonly documented in EEG. brain activity while a person is in a devotional Yogic state, or in deep meditation or asleep. (Newberg; 2010;160).

However, babies, very young children, monks and people suffering from brain damage also register these waves. It is also important to note that devotional songs of Group B and C does brings changes to the brain cells as well. The electroencephalographic profile is modified by the practice of meditation of the devotional songs. In Group B shows less Alpha and Theta percentage changes than Group A. The cause could be due to less contemplation or less meditational brain activity. This report on the background of Group A, B and C fecilitates the functional rationalization of the EEG signals of each group. Naturally, Group A, EEG signals are of better value than Group C and Group B. Group C signals are better than Group B. Further analytical observations can be done by neuroimaging studies, most often by employing fMRI. Some scholars state that the sleep-like changes of EEG, are observed in hypnotic trance where the Alpha,Theta and Delta pattern appear in closed eyes' condition. EEG in the hypnotic state caused by sleep suggestion reveals the low voltage Theta pattern which is similar to the drowsy mental state.

Theoritically the hypnotic effect of the devotion and *sangeetham* can cause the Theta and Alpha waves which are recorded in EEG4 where the eye are open. It may corresponds to a hyponotic effect of *sangeetham* or deep sleep stage. It is noticed that the slow rhythm in hypnotic sleep is more similar to the rhythmical Theta activity seen in Zen meditation (Akira Kasamatsmu and Tomio Hiram, 1966:335).

To clear the controversy of sleep, the researcher questioned the candidates if they were as sleep? The candidates categorically denied. Therefore, these electroencephalographic signals lead to the following conclusions from the multiple proceedures that Tyagaya's devotional *sangeetham* caused a meditation effect on the brain. The devotional contemplation of Swami Tyagaya' *sangeetham* has the capacity to transcend the mind from a physical level to a metaphysical level. It may be said, therefore, that the large amplitude and slow frequency Theta and Alpha pattern of Group A is a foregoing pattern of transcendence to a higher level of consciousness. Perhaps, even the other forms of devotional music, such as experienced by Group B and C can cause the lower threshold in the brain activity.

The personal history denotes that the candidates of Group A are deeply involved with *sangeetham* and prayers which creates a positive setting for the brain wave modulation. The brain develops through behavioural experiences. The process of singing and understanding the language creates an experience. Experience is a brain condition and it is the knowledge acquired through the occupation. Therefore, their advance age and family status and Swami Tyagaya's *sangeetham* experience are the cause for the high 100% alpha waves and 68.75% theta waves which is the proof to indicate that the positive brain signals are due to the stumuli of

sangeetham.The Group C volunteers findings indicated values for a second place and while Group B student volunteers were a distant third. It has become apparent in our study that the electrographic changes of Group A devotional *sangeetham* meditation have the appearance of high percentage of Theta and Alpha waves without regard to opened eyes. These Theta and Alpha waves increase during Swami Tyagaya's *sangeetham* denotes meditational dimension of the relaxed brain. These findings are also parallel with the degree of Group C mental states. From the electroencephalographic point of view the results are coincidental with the EEG changes of lowered consciousness or vigilance states that the persistent appearance of alpha waves which indicates the brain function at the time of lowered vigilance in the Zen meditation (Kasamatsmu, 1966:333).

Kasamatsmu says, "Many empirical observations of Alpha waves point out its being not of action but of hypofunction of the brain and in attempting to relate the various stages of the EEG pattern to corresponding psychological states and the behavioral correlates. It states that during more or less continuous relaxed state of wakefulness, amplitude modulated alpha waves are characteristic". According to Jasper's suggestion, it is said that the amplitude modulated alpha waves reflect the lowered level of the cortical excitatory states (Kasamatsmu, 1966:334). EEG changes during Zen meditation seem to indicate that the cortical excitatory level will be gradually lowered even by the "concentration" of inner mind (Kasamatsmu, 1966:332). The researcher points out that from a psychological point of view, that devotional *sangeetham* like Zen meditation have a hypnotic trance which bring about the change of consciousness to envision God. It is a personal experiencial imagery and an extera sensory perception.

The background survey of the EEG volunteers indicates that the Group A and Group C volunteers had identical answers for the four questions which gives a score of 100% respectively. The volunteers of Group A and Group C were emotional and described their experience as a holy incident. The issue of belief in God was 100% positive in both these groups while Group B answered with less percentage. The finding proved valuable for the meditative nature of Group A and C. Table 54 explains the significance of the percentage of Alpha, Beta, Theta and Delta Waves. The EEG finding of stage 2 and 3 shows the different electrical signal patterns from the brain after the concentration of Tyagaya's Devotional *sangeetham* and devotional songs. In Group A the volunteers perceive *sangeetham* and religion as important entity. Their devotional consistancy has contributed to their mental and spiritual health. They have experiencial knowledge of empathetic listening, documenting spiritual preferences and incorporating the precepts of their spiritual traditions and communities for overall wellness. Their practising knowledge of *sangeetham* cultivates their inner spiritual resources which has brought profound change to their brain activity and relaxed pious nature.

The Group A, B & C findings will pronounce significant information of the activity of the brain durning the influence of devotional meditative *sangeetham*. The findings of the volunteers' environmental background will further help to substantiate the devotional and experiential values. Experience is a brain condition of neurobiological nature. The devotional experience of singing Swami Tyagaya's *sangeetham* familiarises the brain through neural plasticity. The environmental factors interact with brain cells and bring changes. The intransic and extransic dynamics support one another in brain development. The comparison of the three

group experiential knowledge clarifies the pattern and nature of devotion and identifies the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God". The objective EEG findings are scientifically significant to arrive at a favourable conclusion and prove that the current study is properly substantiated. Thus, the positive results of the EEG helps to strengthen the value of the third objective of the study.

5.8 RATIONALIZION OF SWAMI TYAGAYA'S SPIRITUAL EXPERIENCES

The study reveals about the comprehension of Swami Tayagaya's devotional *sangeetham* from the perspective of cognitive neuroscience and in association to spiritual experience. The study rationalizes the spiritual experience through scientific explanations. The findings indicate the society's perception on devotional music and its spiritual manifestations and how they relate to life. The activating stimuli for neuroplasticity is concentration, belief, effort and devotion towards *sangeetham*. The mental activity of listening Swami Tyagaya's kritis elevates the level of consciousness. Accoring to Kasamatsmu; "Thus the activating pattern indicates the augmentation level of Zen meditation in the concentrated regulation of inner mind". It is of prime interest to consider a relationship between the *sangeetham* physiology of the brain and the level of consciousness. The lowering of brain activity is confirmed by the EEG findings of the three groups. According to the instructions of Zen meditation, the regulation of inner mind is strongly emphasized and in the well-achieved meditation, it will be said that concentration without tension is the true concentration of the inner world of psychic life (Kasamatsmu and Hiriam, 1966:331).

God is great for the mental, physical, and spiritual health point of view. Swami Tyagaya's composition written in accessible style with Upanishadic illustrations highlights spiritual experiences and righteous living with compassion, love, tolerance and selflessness. The devotional *sangeetham* of Swami Tyagaya elevates the mind to a higher spiritual level. Not only do prayer and spiritual practice reduce stress and anxiety, but the meditational feature of devotion may slow down the aging process and increase mental and physical health. The research offers the following breakthrough experience and informations of some Neuropsychologists. Many neuroscientists have performed complex researches on the brain when in religious contemplation and in meditative singing or chanting. They have put forth astounding theories of "God Centre" in the brain cortex. Modern Neuroscientists' are able to visualize through modern imaging techniques the brain when in spiritual activation. Michael Persinger, a neuropsychologist of Ontario University, described a religious experience when the the right hemisphere of the brain, the seat of emotion, is stimulated. The brain generates increase electrical activity with religious experience or God sensation.

Dr Andrew Newberg, is a prominent researcher on spiritual experiences and brain imaging. He has taken particular interest in meditation and neuro-psychological experiences. He says, "God is apart of consciousness and that the more you think about God, the more you will alter the neural circuitry in specific parts of your brain". "That is why I say with utmost confidence that God can change your brain" (Newberg, 2010:4). Dr. Richard Davidson of the University of Wisconison has been working with some advanced maditators and he found that these meditators had an extraordinery skills in manipulating certain parts of the brain that control thoughts

and emotions including the capacity to generate compassion (Newberg, 2010:62). Dr. Daniel Levitin has worked on music perception and cognitive psychology.He has explained the role of cerebellum in music listening and the temporal cortex. Dr. Oliver Sach has wealth of experiences with normal brains dealing with perception, memory and individuality. He has contributed much in support of the effect of music on the human brain. Dr. V.Ramachandran thinks that there is a neural circuit for God experience somewhere in the temporal cortex (Ramachandran, 2012:179). Therefore,it is apparent based on the scientific research that Swami Tyagaya's experience of the vision of Lord Rama is possible.

To illustrate more scientific evidences some neuroscientist have produced EEGs and images of the brains of Hindu sages, Buddhists monks and nuns in deep meditation and prayer. They scanned the brain to determine what part of the brain was active and what parts were was not active. Using a special X-ray procedure called fMRI or SPECT, the scientists were able to see unique activity in the brain during chanting of mantras and meditation. The different pattern of brain activity in the particular brain region may explain why meditators feel transported out of the physical world and into a spiritual world. *Sangeetham*, hymns. mantra chanting and meditation intensifies the focus, blocks out the external stimuli, and provides a pathway in the special brain areas for a mystical experience.

Dr Newberg says, "As the boundaries between self and physical surroundings go away, the meditator feels at one with something larger, whether a religious community, the world as a whole, or ultimately, God," (Newberg, 2010:37). Newberg says, "Understanding how the brain works can go a long way toward understanding

the impact of religion, both physically and spiritually". Newberg explains,"With religious experiences such as meditation or prayer, decrease and changes in hormone levels may improve the function of the immune system" (Newberg, 2010:34). Brain activity studies show that meditation is not just a passive experience but that increased excitability at peak meditation seems to confirm the "active bliss" reported by Newberg's study subjects. Newberg says,"They feel profoundly calm, yet highly alert and intensely aware". "Spiritual experiences are more real to them than everyday reality walking down the street. Pietrini says, "We are looking at philosophy and religion in a more scientific way" (Newberg, 2010:82). "Science has no way to prove or disprove a Creator, but finding unique patterns of brain activity corresponding to religious experiences is entirely compatible with religious beliefs" (Newbrg, 2010:91). EEG has been usefull in understanding musical behavior of the brain structural points such as the frontal lobes, Broca's area, Wernic area and temporal lobes (Levitin, 2006:124). The brain music system appears to operate with functional independence from the language system and the evidence comes from many case studies (Levitin, 2006:125).

Though skeptics may argue that God lives only in the mind of the faithful, Newberg suggests that the opposite conclusion is equally valid. "If there is a God, it makes perfect sense that He would create a way for us to communicate with Him" (Newberg, 2010:104). Religion and spirituality are constantly changing and evolving, and this is a good thing for both the society and the human brain (Newberg, 2010:82). Vilayanur Ramashandran, thinks he may have found God. The neurologist believes that there may be neural circuitry for religious experience. He points to the fact that about 25% of patients with temporal lobe epilepsy are obsessed with religion.

(Ramachandran, 2012:176). Neuroscientist have shown just how intimately the amygdala is activated by music which has a strong emotional function with the hippocampus (Levitin, 2006:163).

Some studies conducted in various research centres suggest that the meditative nature of devotional *sangeetham* can help maintain a healthy structural balance of the mind and body. The biology is triggered by superior environmental education. Nature and nurture plays an active role in the evolution of the mind to visualize God. The meditative wisdom takes place continually, and memories are being constantly revised. Spiritual ideas merge into consciousness. Spiritual *sangeetham* is a contemplation of God (*Ishta Deva*) which constantly creates a neuroplastic activity in the brain. It is understood that the spiritual concepts are formed in the frontal lobes, occipital lobes, limbic system and anterior cingulate cortex (Newberg, 2010:44).

It is known that by intensive meditative *sangeetham* there is a possibility to trigger an unusual form of neural activity and evoke specific emotions and focus the thoughts in spiritual forms of God, like Lord Rama or Lord Siva or Christ which can biologically influence the physical form. It is also known that by meditative singing essential body dynamics like respiration, circulation, body awareness, feelings, thoughts, tension and stress can be manipulated for good health. From Swami Tyagaya's point out in his *kriti* "*sobillu subtha awara*", the more one engages in spiritual practices like singing devotional *sangeetham*, the more control one gains over the body, mind, and destiny (Ramanujachari, 1958:596).

Some neuroscientists consider the anterior cingulate cortex, the frontal lobe, prefrontal cortex, the limbic and para limbic system to play a significant role in spiritual alteration (Newberg, 2010:130). Dr. Newberg's experiment indicate that the brains of Tibetan Buddhists and Franciscan nuns as they engaged in deep prayer and mediation by injecting radioactive dye as the subject entered a deep meditative state, then he photographed the results with a high tech imaging camera. He noticed that when people meditate they have significantly increased activity in the frontal area which is the attention area of the brain and decreased activity in that orientation part of the brain (Newberg, 2010:6). Newberg unanimously acknowledges that meditation can change the neural circuitry and improve cognitive health, social awareness, empathy and spiritual health. Meditation can subdue vicious mental feelings, anger and negative emotions. The human brain through meditation has the capacity to rearrange the brain cells in response to a wide variety of positive spiritual responses.

Based on the scientific dynamics, Swami Tyagaya's deep *sangeetham* contemplation and devotion can create a brain phenomena that influences the visualizion of God, Lord Rama. The study points out this association as the evidence for the brain's neurospactic capacity to envision 'God'. The EEG results of Group A, indicates sufficient evidence to indicate special brain activities as per Table 53 and 54. Many of the brain changes occur when people are singing devotional *sangeetham* like praying (focusing on oneness with a deity) or meditating (focusing on oneness with the universe). The *sangeetham* activates the visual center, auditory center, language center and the senso-motor centers in the brain. Rationally the God vision is from the God centre in the brain. Dr. Newberg uses the term "God module" (Newberg, 2010:101).

Many neuroscientists have identified a region of the human brain that appears to be linked to thoughts of spiritual matters and prayer. Their findings suggest that God is programmed in the brain through intrinsic and extrinsic factors. At the moment of time, brain science is not absolutely certain how to measure and authenticate the neurological events associated with religious *sangeetham* to God. Philosophers and scientists have long argued that God is a construct of human mind. There has been fierce theological disputes over this matter. Now there are new evidence that the phenomenon of religious faith is in the brain. Doctors are currently studing on yoga practitioners and advance meditators to map the neurochemical changes caused by spiritual and religious practices (Newberg, 2010:6).

This discussion based on all the researches of the neuroscientists indicate that Tyagaya's *Sangeetham* strongly influences the general perception on God, brain, devotion and spirituality. The spiritual experience of Swami Tyagaya is compatible to the scientific reasoning. Swami Tyagaya's life was a confluence of spirituality, saintliness and *sangeetham*. His musical composition is an authentic revelations of what he directly experienced. His purpose of *sangeetham* is salvation, moksha. The survey brings forth the society's view on the meditative nature of devotional *sangeetham* and to the broad range of holistic questions of spirituality in the brain. This research does not in any way negate the validity of religious experience or God but they merely provide an explanation in terms of the brain regions that may be involved in devotional meditation through Swami Tyagaya's *sangeetham*. Scientists now look at the human brain as a constantly changing mass of activity and conclude that neurons act to spiritual singing and meditation. The different types of mantra chanting, meditation, prayer and devotional singing affect different parts of the brain

in different ways. Each meditative experience appears to have a beneficial effect on the neurological, physical and emotional health of the individual. The EEG experimental findings show that Swami Tyagaya's devotional *sangeetham* relaxes the different regions of the brain like the the frontal, parietal, temporal, and limbic areas or decreases the metabolic activity in these areas. The researcher's EEG findings confirms with the observations of the studies done by Kasamatsu and R. Sudarachari.

5.9 CONCLUSION OF EEG RESEARCH

The EEG data analysis explains significant Alpha and Theta activities in Group A against the two control groups. All the Group A volunteers find that their devotional emotions are heightened and linked with very deep states of both physical and mental relaxation when listening to Swami Tyagaya's *sangeetham*. Alpha and Theta waves are associated to *sangeetham* lovers who are in meditative states. This emotional state probably is the cause for 83% Theta brainwaves of Group A volunteers. In Group A, the influence of Swami Tyagaya's *sangeetham* has produced 100% Alpha activity in both the stages which denotes meditational brain state. The Group B and C findings also denotes significant information of the activity of the brain during the influence of devotional songs. The research clarifies the nature of *sangeetham* and devotion in Group A and identifies the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God". The Alpha findings denotes meditational state and relaxed brain activity. The significant observation is that the Alpha and Theta activities of Group A confirms with the results of the studies done by Sundarachari and Kasamatsu.

The evidences of the EEG results are scientifically significant to arrive at a favourable conclusion and prove that the study is properly substantiated. The study successfully rationalizes the devotional *sangeetham* and spiritual experiences through theoritical and scientific explanations. The study explains the comprehension of Swami Tayagaya's devotional *sangeetham* from the perspective of cognitive neuroscience. The study elaborates the society's perception on Swami Tyagaya's *sangeetham*, devotional music and its spiritual implications from a psychological point of view. The positive results of the EEG strengthens the value of the third objective of the study.

5.10 Conclusion of the Questionnaire survey and the EEG research

In conclusion, the complex study has focused on many theoretical and empirical evidences that the practice of Swami Tyagaya's *sangeetham* clearly facilitates brain changes and spiritual values. The study reports several statistical findings in the survey and also reports on the results of the EEG experiments. The specific statistical findings reports a number of critical demographic information. The information demonstrates both descriptive statistics and anova tests results based on gender, age, academic specialty, economic status, musical skills, and research productivity which indicated positive evidences. The survey results with the SPSS 22 statistical module correlates significantly with the objective of the study. The survey methodology approach is forceful and practicle to the rationale of the study. The individual data are realistic and can be used as an exemplar for other alternate level of studies.

The survey model is recommended for many other macro-level models in the future. The survey results integrates more realism into the subjective and the objective evidences of the study. The demographic information is also investigated against six null hypotheses and the results showed strong positive correlation between *sangeetham*, devotional reliance, God, brain and spiritual feelings among the Indians. The Six null hypothesis is rejected with the alternate hypothesis successfully. The conclusive statistical data are that, 80% of respondents believe God acts through devotional music through the spiritual enlightenment; 75% feel that compassion and tolerance are important for life; Faith in God is stronger among women and *sangeetham* lovers. 75% believe that God acts through Tyagopanishads are more likely to be Carnatic musicians.

The evidences of the EEG electrical signals correlated differently towards Swami Tyagaya's *sangeetham* versus devotional songs. The Group A, EEG electrical signals are different from Group B and C brain activity. There are increase number of Alpha and Theta signals in Group A volunteers indicating relaxed mental states. The background evidences of the volunteers have assisted to substantiate the importance of Alpha, Theta, Delta waves. In the Group A volunteers the Alpha and Theta signals correlated positively and showed that there was a single underlying factor that we may call ''God module in the brain.'' In Group A, the dominance of the Alpha and Theta signal suggested a localized relaxed brain activity which incidently co-related with the EEG research findings of Kasamatsu and R Sudarachari.

The evidences of both the survey and the EEG provide strong statistical significance and scientific implications to the value of the study. The demographic findings, the questionnaire survey results, the alternate hypothesis and the high percentage of Alpha and Theta waves in Group A facilitate to uncover and clarify the social, philosophical and scientific knowledge of Swami Tyagaya's *Sangeetham*. The EEG results clarifies the scientific nature of devotional *sangeetham* and identifies the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God".

The study shows clear evidences to infer that there is a close link between long term devotional *sangeetham* singing and brain changes. Specific brain areas are associated with superior spiritual quality. The research proves that Swami Tyagaya's devotional *sangeetham* brings spiritual changes in the brain. The devotional dimension creates a paradigm shift from the physical level to a metaphysical level. The subjective survey evidences are statistically significant and the objective EEG signals are scientifically significant to arrive at a favourable conclusion that Swami Tyagaya's *sangeetham* produces brain changes for spiritual nature. The study demonstrates the feasibility of Swami Tyagaya's devotional *sangeetham* in the attainment of divine sentiments and God realization as a self-regulatory approach to emotion management. The evidences of the literature review, the questionnaire survey and the EEG results substantiates the first, second, third and fourth objectives of the study.

CHAPTER SIX

CONCLUSION

Tyagaya's devotional *Sangeetham* creates an emotional and meditational effects in the brain. Tyagaya's *Sangeetham* by virtue of its religious nature reduces the agitated activity in the brain. The melody and the harmony are responsible for calming the complex nervous system. Tyagaya's devotional *kriti*s acts as a pathway to accomplish a needed function of 'God' realization. The needed function is for the brain cells to remain serene and concentrate on the intrinsic holy factor. The stimulated brain cells create an emotional atmosphere to envisage God imagery. The persistent dynamics of singing Swami Tyagaya's *kriti*s and the consistent contemplation of sacred devotion creates deliberately a specific spiritual emotion. This is possible by the neuroplastic changes in the brain brought about through constant spiritual thought and experience.

Devotional Meditation through *Sangeetham* is good for the brain and it brings one closer to spirituality. Spirituality rapidly establishes intimacy with qualities associated with love and compassion Swami Tyagaya's Devotional *Sangeetham* is a form of meditation. The language and the devotion create love and compassion. These qualities of intimacy foster greater degree of personal health (Newberg, 2010:215). Compassion is a fundamental tenet for all spiritual tradition. The communication through love is essential for all forms of interpersonal relationship.

The emotional character of *Sangeetham* triggers the neurological ability to express kindness, empathy and forgiveness. It is associated with communal and

psychological health. The brain neurons are responsible for the external influence. *Sangeetham* stimulates the respective brain centres. Singing Tyagaya's *Sangeetham* can be a effective medium to enhance interpersonal relationship and deepen spiritual bonds. Tyagaya's devotional compositions bring serenity and awareness into the spiritual contemplation. His spiritual *Sangeetham* resonates in the emotional areas of the brain.

A survey of Spiritual experience conducted by Newberg found that after meditation 60% increase in a desire for peace and desire for love tripled (Newberg, 2010:221). Newberg's survey 80% said that they had some form of sensory, visual, or auditory experience. People described seeing light, colors, or auras; hearing sounds like humming or ringing; or hearing voices. These sensations greatly enhanced the power and meaning of their experience. Some have confessed that during meditation, they have experienced their consciousness suspended in infinite space. Some have had the experience of unity with all that around. Some have experienced a Divine presence (Newberg, 2010:88).

In comparison, the overall conclusion of the researcher's survey on the perception of Swami Tyagaya, devotional *Sangeetham*, God, brain and Spirituality denotes that 70.2% of the respondents agree that their involvement in *Sangeetham* and Swami Tyagaya's composition will increase their interest. 78.8% of the respondents were inspired to devotional music. 78.8% of the respondents agreed that their interest in the God centre in the brain will accelerate. 81% of the respondents approved that they may be motivated towards spirituality. 83.4% of the respondents felt that they were encouraged to practice compassion and tolerance. 86.4% consider

singing devotional songs as a meditational exercise to the brain. 90.3% consider singing to devotional music important. 88.5% like listening to devotional music. 75.2% enjoy listening to Carnatic *Sangeetham*. 75.9 % agree that spiritual feeling is related to God feeling.

The researcher's observation from the comparative findings is that there is not much of fundamental differences in the application of spirituality in the form of love, tolerance, freedom and compassion but the difference appears in the understanding of God according to the respective beliefs and religion. The local society overwhelmingly supports devotional *Sangeetham* of Swami Tyagaya having a profound influence in them. God is a mental picture and is expressed as an experience. Women were more comfortable with *Sangeetham* and God. High socioeconomic status shows greater tolerance. Education encouraged people to be more accepting of neuro-psychological thinking. Faith in Swami Tyagaya is stronger among women and *Sangeetham* lovers. Those who believe in devotional characteristics of Tyagopanishads are Indians and Carnatic musicians. The environment place a distinct role in the behavioral conditioning. Religion and spirituality influence one another. Spirituality invariably advocates compassion, love, contentment and tolerance.

The researcher illustrates the statistical relevance of the survey findings to the objective of the study and substantiates the merit of the study. The high percentage of the findings demonstrates the value of Swami Tyagaya's devotional *Sangeetham* towards spirituality and religion. The advance statistical analysis successfully provides subjective evidences on the values of Tyagaya's devotion and

his vision of God, Lord Rama. The discussion overwhelmingly reports that Swami Tyagaya's devotional *Sangeetham* has complex association with the brain network in relationship to God. The analysis amplifies positively the voices of the hundreds of volunteer who have come forward to tell their experiential views of *Sangeetham*, Swami Tyagaya, brain, devotion, God and spirituality (Tables 1 to 27). The statistical correlation of the major variables in (Table 28) are significance for the creative power of Swami Tyagaya's *Sangeetham*, neuro-psychology and spirituality. The impact of these factors has produced encouraging relevance to the subject of the study.

The six alternative hypotheses have successfully rejected the null hypothesis, (Tables 29 to 34). The alternate hypothesis show valuable affirmative correlation between *Sangeetham*, devotional reliance, God, brain and spiritualism. These findings indicate that devotional *Sangeetham* strongly influence the spiritual contemplation and brain activity. The most important findings are that 80% of respondents believe God can be visualized through the consistent practice of devotional music which paves the way for the spiritual enlightenment. 80% of the respondents believe that devotional music motivate towards spirituality and 50% of them judge that Tyagopanishad and *Sangeetham* are beneficial for spiritual study. 60% of the respondents think that "God image" can be visualized in the brain. 87% of the respondents believe that the most important factor to understand God is to be righteous. 85% of the respondents feel that compassion and tolerance are important for life and 80% appreciate that faith in God is significant. The overall logistic perception is that the local society have strong faith in God, devotional music, Swami Tyagaya's spiritual experiences and the brain science.

It can be seen from the overall statistical inference that the demographic and the statistical findings have helped to uncover and clarify the communal, scientific and theoretical knowledge on Swami Tyagaya, *Sangeetham*, Brain, devotion, spirituality and God. The findings and the discussion have illustrated the pattern and nature of devotion and identified the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God". The overall logistic perception is that the society believes in God, Devotional music, Swami Tyagaya's spiritual experiences and the brain science (Table 35 to 39). The subjective survey findings contribute significantly to arrive at a favourable conclusion and prove that the study is properly proved.

The next major evaluation is the outcome from the electro-encephalogram experiment. The EEG data analysis explains significant Alpha and Theta activities in Group A against the two control groups. The Group A, EEG electrical signals percentage are superior to Group B and C brain activity. In Group A, the dominance of the Alpha signal suggests a localized relaxed brain activity and the dominance of the Theta signals are associated to *Sangeetham* lovers who are in meditative state. The background history of Group A, B & C have assisted to substantiate the importance of Alpha, Theta, Delta, and Beta waves (Table 48).

The emotional state probably is the cause for 83% Theta brainwaves of Group A volunteers. In Group A, the influence of Swami Tyagaya's *Sangeetham* has produced 100% Alpha activity in both the stages which denotes a significant evidence for meditational brain state. The Group B & C findings also demonstrates information

of the activity of the brain during the influence of devotional songs but the percentage of Alpha and Theta signals are smaller (Table 53 & 54). The discussion clarifies the nature of *Sangeetham* and devotion in Group A and identifies the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God". The entire Group A volunteers admit that their devotional emotions were heightened and linked with very deep states of both physical and mental relaxation when listening to Swami Tyagaya's *Sangeetham*. The Alpha, Delta and Theta findings denotes deep meditational state and relaxed brain activity. The observation of Alpha activity of Group A, incidentally co-related with the EEG research findings of Kasamatsu and R Sudarachari.

The evidences of both the survey and the EEG provide strong statistical significance and scientific implications to the value of the thesis. The survey results and the Alpha and Theta signals are scientifically significant to arrive at a favourable conclusion and prove that Swami Tyagaya's *Sangeetham* correlates with the objective of the thesis. This means that in the Group A volunteers the Alpha and Theta signals associated positively and showed that there was a single underlying factor that we may call ''God module" in the brain. The concept of "God" exists in the brain as a combination of ideas, sensation and images was explained by Dr Newberg. (Newberg, 2010:43).

The study successfully rationalizes the devotional *Sangeetham* and spiritual experiences through theoretical and scientific explanations. The thesis explains the comprehension of Swami Tyagaya's devotion from the perspective of cognitive neuroscience in association with spiritual experience. The study elaborates the

society's perception on Swami Tyagaya's devotional *Sangeetham*, brain and spirituality through the valuable statistical evidences. The evidences of the survey, the EEG and the literature assessment substantiates the first, second, third and fourth objective of the current study.

The demographic findings, the questionnaire survey results, the alternate hypothesis and the high percentage of Alpha and Theta waves of EEG in Group A facilitate to uncover and clarify the theoretical and scientific contribution of the study. The EEG results clarifies the scientific involvement of devotional *Sangeetham* and identifies the long environmental influence that perhaps creates the state of relaxation of the brain to visualize "God". The study shows clear evidences to infer that there is a close link between long term practice of devotional *Sangeetham* and brain changes which can result in spiritual transformation. The study proves that Swami Tyagaya's devotional *Sangeetham* produces spiritual changes in the brain. The devotional emotion transcends from the physical state to a spiritual state and shape the perception of "God".

The subjective survey evidences are statistically significant and the objective EEG signals are scientifically significant to arrive at a favourable conclusion that Swami Tyagaya's *Sangeetham* produces brain circuit changes of spiritual nature allowing the individual to become loving, and compassionate. The study demonstrates the relevance of Swami Tyagaya's devotional *Sangeetham* in the attainment of divine emotion and God realization.

Therefore, the spiritual emotion stimulates dramatic divine experiences. The study deduces that those who sing and meditate appear more spiritual, compassionate, tolerant and loving to mankind. The contemplative nature of singing Swami Tyagaya's devotional *Sangeetham* trains the brain to be calm, loving, kind and considerate. This endeavor of cultivating compassion and kindness through *Sangeetham* affects brain regions like amygdale, hypocampus, anterior cingulate, frontal, occipital and other regions that can make a person more empathetic to other person's psychological state and shape the perception of God. Swami Tyagaya's devotional *Sangeetham* creates a meditative effect that makes the brain feel serene, peaceful and sanctified. Dr Sack says, "Music can lift us out of depression or move us to tears - it is a remedy, a tonic, orange juice for the ear. But for many of my neurological patients, music is even more - it can provide access, even when no medication can, to movement, to speech, to life. For them, music is not a luxury, but a necessity (Oliver Sacks, 2011:11).

Neuroscientists have discovered new scanning techniques to learn more about the dynamics of the human brain which will be the scientific tools for the future. Brain researches are beginning to produce concrete evidence for the "God Thought" that Swami Tyagaya envisioned through his *Sangeetham*. Mental discipline and meditative practices can change the workings of the brain and allow people to achieve different levels of cosmic consciousness. The depth of consciousness transforms a divine experience to a state of visualizing God which is understood in transcendental term as something outside the world of physical measurement and objective evaluation. God is a metaphysical connotation of human knowledge.

Thus, the study confirms that Swami Tyagaya's *Sangeetham* can bring emotional changes in the brain and establish spirituality in the form of compassion, love and divine vision. The direct experience of devotional emotion relaxes the brain's neurological circuit and heightens the visual and auditory capabilities to see and hear 'God' which Swami Tyagaya experienced in his spiritual vision. Swami Tyagaya's *Sangeetham* is a mental exercise where the senses are saturated with the sight, sound, taste, touch and smell of spiritual heritage and belief. Swami Tyagaya's spirituality has the ability to discipline and organize the brain to successfully motivate life and control negative activity like anger, hostility and intolerance. Swami Tyagaya's *Sangeetham* can engage the society spiritually and activate compassionate communication with human kind.

Dr Newberg says, "Music can stimulate the immune system, the motivational system, the aging brain, memory and concentration into good action. The hand and body movements of helps control movement health disorders like parkinson, alzheimer, Tourette's and Huntington's disease (Newberg, 2010:30). *Sangeetham* has a role in therapeutic purposes. There should be more scientific studies on Swami Tyagaya's *Sangeetham* from the stand point of theology, and neoro-psychology

Finally, the researcher ascertains through the literature evaluation of Swami Tyagaya's compositions and Neuro-psychology about devotional *Sangeetham* and the God module in the brain and thus proves with relevant evidences the first and the fourth objective of the thesis. The researcher establishes the society's view through

the questionnaire survey a close correlation towards Swami Tyagaya *Sangeetham*, brain, God and spirituality and thus presents adequate statistics to prove the second objective. The researcher institutes an EEG experiment which correlates relevant brain signals in association with Swami Tyagaya's *Sangeetham* and thus provides scientific evidences to prove the third objective. Thus, the study confirms that Swami Tyagaya's *Sangeetham* can bring emotional changes in the brain and establish spirituality.

1. Devotional *Sangeetham* of Swami Tyagaya elevates the mind to a higher spiritual level. God-realization is made easy and convincing by the best means of practicing devotional *Sangeetham* while the magnitude of the singing endeavour lies in the focus of the action.

2. Spiritual enlightenment is attained through devoted years of intense meditational singing and righteous living which is an environmental conditioning of the brain.

3. The meditational sound vibration throws light on the complex formula of cognitive-perception-realization system in the brain. This spiritual practice (*sadhana*) culminates in inner peace and happiness.

4. Neuroscience experimentation proves that *Sangeetham* sensibility sends neurological potentials through the neural circuits which activate new dendrites and synaptic connections causing spiritual emotion. If the will is set on reaching a spiritual goal, the neurons will enhance the sense that a spiritual reality can be experienced.

5. This subtle neural stimulation of the brain activates the perception of the experience and the mind exhibits the neurological phenomenon of the 'Brahman or God". Thus, the spiritual sensation of 'God' becomes neurologically real.

6. Swami Tyagaya's Spiritual music reduces fear, anxiety, depression, and stress. It increases feelings of security, compassion, tolerance, humility and love. This spirituality is centered on personal well-being, psychological advancement and moral personality. such as righteousness, forgiveness, love, patience, tolerance and altruistic values. *Sangeetham* can enhance health and can be used as a health therapy.

Recommendations

1. It is recommended that further research in the area of Swami Tyagaya's *Sangeetham* and communication to God is necessary. More studies using randomized controlled trials are needed. The research must focus to improve dialogue and intimacy in relationships in order to produce a compassionate society.
2. The future researches should estimate the levels of electro-chemical transmitters of the brain when subjected to Swami Tyagaya's devotional singing in order to reduce stress, anger, jealousy and greed.
3. Research in *Sangeetham* and its devotional dynamics using brain imaging scans such as, Functional magnetic resonance imaging (fMRI, PETscans). These kinds of scientific investigation has not been researched till today on *Sangeetham*. The future researches should involve the neural circuits of the emotional centres associated to God sensation.
4. Research on *Sangeetham* as a tool to be incorporated into schools for psychotherapy and into hospitals for health therapy.
5. Further work is needed to understand the possibility positive effect of *Sangeetham* and meditation.

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