Music has been a medium of therapy for centuries, and there are numerous examples of the curative and healing powers of music in the historical records of different cultures (Wigram et al., 1998). Various tall claims have been made about the healing powers of music. As poet Rabindranath Tagore had said ‘a sword can kill an enemy but cannot destroy enmity. It is only music which can destroy enmity.’ Such expectations from music have lead to its use for therapeutic purposes. (Wigram et al., 1998)

Music therapy

In 1996 the World Federation of Music Therapy (WFMT) produced the following definition:

- Music therapy is the use of music and musical elements (sound, rhythms, melody and harmony) by a qualified music therapist with a client or group, in a process designed to facilitate and promote communication, relationships, learning, mobilization, expression, organization and other relevant therapeutic objective, in order to meet physical, emotional, mental, social, cognitive and therapeutic objectives. Music therapy aims to develop potentials and/or restore functions of the individual so that he or she can achieve better intra and inter personal integration and
consequently, a better quality life through prevention, rehabilitation or treatment. (WFMT 1996)

**Human experience of music**

**Physical level**—Music exists on a physical level. A string produces a tone by vibrating at a specific speed, and today it is described as the concert pitch. It makes an equal 440 vibrations per minute (measured in hertz) and that it becomes audible by making the molecules of the surrounding air vibrate at the same speed. When these vibrations meet a human listener's ear, complicated perceptual and cognitive operations in the brain lead him/her to the conclusion that the tones are played (Wigram *et al.*, 1998).

Then the tones are perceived by the person and this leads to the formation of thoughts. These thoughts, in turn lead to emotions. Sometimes the tones on their own lead to the emotions. So, it is seen music affects the entire psychological being of a person.

**Early experiences**—Our early experiences of sound are very formatives. For e.g., singers find their unborn babies are quieter when they are singing, and mothers who play instruments notice that their unborn children are more active while they are playing. The first experience of music is the rhythmic heartbeat of the mother, as a foetus. It is known children need a lullaby to fall asleep. This brings us to face the relaxing effects of music.

Babies only react to about a third of the available acoustic stimuli in their first hours of life, but this rapidly increases, and the first 6 months is the period of learning to hear. After 11-12 weeks babies
prefer human voices to other noise. At 12-14 weeks they can discriminate between their mother's voice and a stranger's and between 14-16 weeks they can stop crying when they hear their mother's footsteps.

Infants sing their first 'babble song' before they say their first word. (Moog, 1976).

The construction of simple songs begins at 12 months, with children gaining some concept of form in the music, developing phrases.

At 2 years, spontaneous songs are emerging with repetitive phrases, clear pitches, melodic contours and rhythmic patterns.

By 3 years 6 months there is evidence of harmonic organization, from 4-6 children make spontaneous 'pop' songs with original words. By 5 years of age children have their collection of nursery rhymes. Human association with sound therefore is basic and primitive.

Cognitive Development-Musical perception alleviates one to the unexplored levels of his potentialities. Being a primitive tool of high attention value it commands considerable mental energy to be directed to it, i.e., the listener concentrates on music much harder than any other stimulus. This concentrated mental energy enables the person to avail his higher cortical functions and therefore improves general functioning and hence his quality of life. Music is also a tool to reach higher levels of consciousness.
'It occurred to me by intuition, and music was the driving force behind that. My discovery was the result of musical perception.'

*(When asked about his theory of relativity)* - Albert Einstein

**Emotional Expression**—Music has always been a tool for expression of human emotions and a source of entertainment. It has thereafter been extended as a therapeutic device. Most researches show that the effects of music are greater when the music has more meaning for the listener. Music has 2 kinds of effects:

- Physical—the music causes pressure waves that are felt in the body.

- Emotional—music creates mood environment to which we respond at a subconscious and non-verbal level. Emotional reactions can also be due to past experiences. *(Wigram *et al.*, 1998)*

Therefore we can ascertain that music is a potent tool for moulding human experience and behaviour.

**Group goal**—Music not only walks us through attainment of individual goals, it also promotes group goals. All countrymen of a country are emotionally bound by its national anthem. As India is held together by 'Janagana mana', America is held by, 'The star-spangled banner', England is held by 'God save the Queen', Afghanistan is held by 'Milli Tharana' and Germany is held by 'Das Deutschlandlied'. Nothing else stirs more patriotic feelings and
leads to more noble tasks than these precise songs composed in the most common language of the country.

So, here we can understand that be it a village girl singing a lullaby for her new born, be it the presidential army rising to protect the nation, music stirs the soul of everyone and enables them to perform their tasks with zeal and enthusiasm. Music has its own language and therefore occupies its own place in everybody’s life.

With this knowledge we can assume that music, when used in a systematic and regular way; will have a therapeutic effect upon the population, clinical or otherwise. Music is therapeutic in nature on its own. Our task is to implement it and execute it in a structured and disciplined manner.

History of Music therapy

In 600 BC Pythagoras worked empirically to quantify the aesthetic value of music. He used monochord (instrument only one string) to experiment with notes and intervals and their relationship to human consciousness. Pythagoras discovered that music is based on the laws of nature. However, he went one step further. The human mind is capable of perceiving the (lawful) vibrations and tone proportions as musical notes and intervals. In Pythagorean thought, notes and intervals are also reflections of a cosmic spiritual level. This level is inaudible, but human being can reflect or mediate on the universal principles, which are also followed by the celestial bodies. According to the Pythagoreans, the planets
vibrate in the same frequencies and proportions as audible music. The discoveries of Pythagoras are still relevant.

In 400 BC the classical doctrine was combined with the dominating medical theories, e.g., humoral medicine a doctrine with great influence through many centuries. In humoral medicine health is influenced by four bodily fluids-blood, phlegm, yellow bile and black bile. According to this theory good health was the result of a harmonic balance between the humours, while disease reflected some sort of imbalance between them. Music was considered a therapeutic tool capable of influencing, even restoring, the balance between humours.

Using music as a healing medium dates back to ancient times. This is evident in biblical scriptures and historical writings of ancient civilizations such as Egypt, China, India, Greece and Rome.

The first mention of music therapy as an independent discipline has been found in De Institutione by Boethius (circa AD 600). At that time music and medicine was based on a few, but concise, theoretical assumptions:

1. In (Neo) Platonic theory the harmonic vibrations systems of music as sound was interpreted as a microcosmic reflection of the vibrations and number proportions found in macrocosmos, e.g., in the periods of revolution of planets and celestial bodies-or in 'the World Soul'.

2. The medical theory of the four bodily fluids (so called humoral medicine, or pathology) maintained that health is a
matter of balance between the fluids/humours i.e., that disturbances of the human mind (mental illness) have somatic origin, and that the balance of humours can be influenced by the vibrations of music.

3. The ethos doctrine maintained that music in different modes has specific properties and potentials of influencing the human mind.

4. Consciousness (the mind) can promote or impair health, music can through the susceptible mind-influence the individual following certain principles.

Psychology of music as a recognized scientific discipline in its own rights started developing in the last decades of the nineteenth century. During this time Helmholtz, Stumf, Rieman and Seashore were the pioneers.

The first phase (1880-1920)-was characterized by experimental research based on a positivistic paradigm: music was considered an objective, empirical phenomenon, and the aim of research was to observe and measure human responses to selected sound stimuli, with special focus on the basic parameters of any tone or sound-frequency, amplitude, intensity and wave form.

This classical cause-effect paradigm was later replaced by a more pragmatic, interactive understanding of music perception and cognition. Contemporary research studies focus on naturalistic conditions, e.g. practicing by high level students, learning in
different cultures or the development of representation in the process by which the child perceives and interprets music.

In 1920s and 1930s new theories were developed from a Gestalt point of view in USA by Mursell (1937) among others and in Germany by Kurth.

After World War II behaviourism and psychoanalysis had a decisive influence on the psychology of music (Feder et al., 1990).

The latest touch to the psychology of music is given by cognitive psychology. They are represented in Europe by the European Society for the Cognitive Science of Music (ESCOM), supporting theory and research through international conferences through international conferences and interdisciplinary journal *Musicae Scientiae*.

As we trace the history of music therapy we can see its steady growth right from 6th century BC till today. From this we can conclude that music therapy as a discipline must have contributed to the prosperity of humanity in order to have progressed the in way it has.

**AUTISM**

**Meaning and Historical Background of Autism:**

The word autism has been derived from 'auto' and 'ism', which means 'to be with oneself'. Initially childhood schizophrenia was used to refer to this condition. Later, after several researches Leo Kanner (1943) used autism as a noun and differentiated autism
from schizophrenia. In 1943, Kanner identified 11 students who had ‘disturbance in affective contact’. The newly found group of characteristics in 11 students was named as Kanner Syndrome. Lastly, Kanner replaced problems with early infantile autism instead of Kanner syndrome. Kanner (1943) carefully and systematically observed some features in those 11 children. Furthermore, he noted that all these features made the disorder different from all other previously described schizophrenia or child psychosis. During the next decade United States workers and Europe’s workers observed children with similar features (Despert, 1951). The features are:

An inability to develop relationships with people, delay in speech acquisition, the non-communicative use of speech after it develops, delayed echolalia, pronominal reversal, repetitive and stereotyped play activities, an obsessive insistence on maintenance of sameness, a lack of imagination, a good memory, and normal physical appearance.

Children with autism do not express an interest upon their age mates. They prefer to play on their own in their own way.

They do not seem to understand or even interested in the simplest social customs like smiling at a known person or sitting in an accepted posture. Even basic need based communication requires to be taught rigorously. They often insist upon sameness like going to the school by the same
road everyday or taking bath then having breakfast and then wearing the school uniform. They feel uncomfortable even with minor alterations in the routine. Most persons with autism have a knack for music.

From these observations and many others, it becomes clear that children with autism are physically as beautiful and innocent as any other child. But still they are different in the way they cognize and behave. They prefer to be alone and even when put together with others they would not interact instead remain aloof. They would neither enjoy nor reciprocate to the warmth of emotional touch, even when hugged by the mother. But at times they might express exaggerated emotion for which others would find no reasons and they would not take any attempt to communicate the reason behind their happiness or disgust. Like any other children autistic children will play, but they will play alone without allowing any intrusion and interference.

Thus, it can be said that they are like us, they are with us but still they are away from us. They are captivated in an island where it is difficult for us to make an entry. It is a situation in which we can see each other but cannot communicate our needs and feelings. Inspite of bearing an intense desire to help them it is difficult for us, though not impossible, to extend our helping hand.

In their entire lifetime they stay in a tunnel. Our aim is to make some holes in the tunnel through which some communication is possible.
Wing and Gould (1979) emphasized on the triad impairments of 'social interaction' and highlighted them as being central to the disorder. The triad includes:

(i) Impairment in social relationship- aloofness and indifference to others.

(ii) Impairment in social communication- absence of desire to communicate with others

(iii) Impairment of social imagination- imitation of activities but without understanding the meaning and purpose. Thus from time immemorial different researchers have contributed their views about autism to facilitate a proper diagnoses. Therefore, later the long list of diagnostic features was reduced to the triad impairments, which are prominently characteristics of autism. They are the impairments in cognition, socialization and communication.

Impairment in communication skill seems one of the significant diagnostic criteria in identifying autism.

According to Vygotsky (1978), language is the key component of cognitive development. Generally, normal children start speaking in second year of life. But before that they express a variety of communicative behaviours like variety of cooing for indicating pleasure and displeasure at end of first year.
This developmental pattern is not followed by children with autism. A speech delay can be taken as the hallmark of autism. Many children latter diagnosed with autism do not utter their first word even well past their age appropriate period. Even children who start babbling age appropriately and have a good vocabulary fail to develop meaningful speech. Unfortunately, in such a case, due to lack of regular usage, loss of the vocabulary is also seen. Some children use certain words which sound like jargons but they do not convey any meaning whatsoever.

One of the salient features of autistic speech is echolalia. Two types of echolalia are seen in them immediate and delayed echolalia. Bloom and Lahey (1978) said some normal children also do echolalia but in their case it is just a part of language development. On contrary autistic children do echolalia because of their poor understandability so that they fail to respond appropriately.

Pronominal reversal is another characteristic of autistic speech. As they have problem in taking another person's perspective they reverse pronoun (e.g. using of you instead of I).

Fifty percent of the autistic individuals are non-verbal or mute. Unlike other language disorder or impairment, the autistic individuals do not use non-verbal modes of conveying message. However, if they acquire speech, then acquisition of language, syntax and the conversational use of language is not adequate in the children with autism.
People who are deaf are mute as well because we learn to speak by imitating sounds. Since they are unable to hear sounds they are unable to make them as well. But things are not so for persons with autism. Their inability is not in hearing but in decoding the semantic and pragmatic messages in the words heard (Deruelle et al., 2010). As a result they are also unable to encode a proper message. This leads to the communication failure.

Impairment in Socialization:

One of the most important criteria for diagnosing autism includes the fact that whether or not the child socialize. Until recently the social aspects of the syndrome were not considered as a major focus of studies related to autism. Although, all diagnosing systems acknowledged the importance of social deviance as a defining characteristic of autism. Recently, researches made it clear that social behaviours can be systematically related to other aspects of child’s behaviour (Volkmar et al., 1985).

Compared to other children of their age autistic children show a pronounced and pervasive inability to relate to others. Autistic children are often described as “aloof”, “isolated” or in their own “world”. Even the highest intellectual individuals are typically unable to sustain more than the most rudimentary social relationships (Volkmar and Cohen, 1985). An autistic child remains happy in his own world and therefore, not bothered about interests, feelings and reactions of other people who belong to the outer world. They, on the contrary, take exquisite interests about the inanimate objects.
Children who cannot or do not speak fail in the non-verbal cues for modulating social interaction. They fail to establish appropriate eye contact. For the high functioning autistic even if social relationship develops, they typically lack the richness and differentiation which is prominent in normally developing children.

Understanding social development typical of autistic children will become more prominent in the light of the knowledge about the normal pattern of social development.

In the normally developing child, social development follows a predictable pattern. 'Affectional bond' and 'attachment' are the key words of social development. Ainsworth (1974) defined affectional bond as relatively long enduring tie in which the partner is important as a unique individual and is interchangeable with nothing else. An attachment is a sub variety of affectional bond in which a person's sense of security is bound up in the relationship.

The infant's emerging ability to recognize individuals and to use facial expressions and other body languages for social referencing is one kind of social cognition, which is considered as another important stepping stone in the normal course of social development. Social cognition comprises thinking about and understanding the emotions, interactions and relationship among people. However, social cognition depends upon the cognitive development. Empathy is a part of social cognition, which involves two aspects: apprehending another person's emotional state and
then matching that with emotional state of oneself. Signs of empathy become prominent as early as 12 to 18 months as soon as the child has a clear understanding of the difference between self and others. Later both empathetic and sympathetic responses become subtle over the preschool and elementary school years.

Deviances in social development in autistic children are apparent in their early years. These are manifested in form of inability to develop reciprocal eye contact and acquire social smile in the first months of life. It must be emphasized that they respond differentially to attentive and inattentive adults (Churchill and Bryson, 1972) and show differential social behaviours to mothers rather than strangers (Sigman and Ungerer, 1984).

To autistic children human face and social interaction hold little importance. The powerful influence of social motivational factors does not appear on schedule and social attachments do not develop when expected though highly unusual and idiosyncratic attachments to inanimate objects like thread, dirt etc. may be seen. Appropriate affectionate behaviour may fail to develop in the first years of life, but may appear later in the course of development.

Development in autistic children is discussed with reference to the key components of socialization:

*Attachment Behaviour*: Autistic children lacks the bond that can attach them to their closed ones. They prefer to isolate
themselves and be alone and therefore spend less time with their parents and caregivers, in comparison to other children.

The child with autism may use his parents and caregivers as a 'comfort-seeking machine'. Apparently, this may appear as a sign of emotional attachment but actually it is not so. A closer observation reveals that autistic child seeks the closeness of his caregiver only when he needs something objectively. Also he will not even allow others to hug or cuddle, if he is not in a need of it. Even when he is hugging he will avoid eye contact with that person.

**Instrumental way of expression** : Social expressiveness is a characteristic of normal socialization, which indicates that children constantly do things to provoke an emotional reaction from someone. This includes early behaviours like pointing, vocalizing at something interesting etc.

Children with autism lack social expressiveness as the quality of relating or expressing to others is different for them. Their way of relating tends to be instrumental rather than expressive. That means they use their caregivers as an "instrument" for fulfilling their wants. For example to indicate his "want for food" he may use the hand of the parent as an instrument to get the jar of biscuits but he will lack the socially appropriate expression that "he is hungry". This mechanical way is labelled as "hand-leading".

When a child hand leads it means he can visualize the sequence of events in his mind, which he wants to happen. As in the previous
example, when the child wants to eat he will lead his caregiver's hand towards the food instead of getting it by himself.

*Social referencing*: Social referencing is an early form of social behaviour which appears at about 6 to 8 months, through which the child communicates his new accomplishments to his parents and others every time he achieves.

The children with autism rarely engage in social referencing. A child with autism may approach something he wants, manipulate it but fail to communicate his accomplishment to others through facial expressions. Thus it can be said that an autistic child takes pleasure to please himself and takes no interest in pleasing others.

*Acknowledgement of others emotions*: This is quite unusual in children with autism. They more often seem to perceive the intensity of one's emotion, but fail to understand whether it is positive or negative. The child generally picks up the arousal level or excitement but cannot discriminate among subtle emotional states or to which direction of the continuum do they belong.

*Developing imitation*: Early imitation is a non-verbal, means of information processing in which a template of something seen is used to shape one's own behaviour in a similar fashion (Wing, 1998). Through imitation a baby can acknowledge the existence of someone else by copying him. It is undoubtedly one of the basic forms of communication, which is only developed and facilitated by social interaction. Imitation is a tool which is used to teach the
child a variety of socially appropriate behaviours for example, waving bye-bye, greeting others, etc.

However, in case of children with autism, they are minimally motivated to imitate or to receive social praise. The more 'social' the imitation, the more difficult it is for the autistic child to master. Similarly, imitation that involves the maximum amount of 'body use' as in waving becomes more difficult for the child to learn.

Therefore, lacking in age appropriate forms of imitation, the autistic children lags behind in socialization.

**RESTRICTED REPERTOIRE OF ACTIVITY AND INTEREST:**

The varied number of behavioural problems, which are observed in autistic children, has been conceptualised as being the overt signs of an underlying deficit related to autism (Schopler, 1989). It is known that sometimes children with autism use aberrant nonverbal form of intentions through these behaviours. Carr and Durand (1984) showed in their study that if they are taught more appropriate ways for conveying their message then their problem behaviours could be decreased. Before looking at the probable reasons of observed problem behaviours, it is necessary to look at the problem behaviours seen in them.

From Kanner's (1943) original description and DSM-IV it is seen that one or more stereotyped and restricted patterns of interest are observed in autistic individuals. Due to rigid and limited nature of play pattern they follow stereotyped and repetitive
motor mechanism or persistent preoccupation with insignificant part of objects.

They often show very restricted interest in play materials. Thus, they endlessly line up toys, shoes etc or play with string, piece of paper etc. The child also anguishes if their play materials are removed.

When they grow older (in their middle childhood and later) they have unusual preoccupation in following same bus routes, train timetables, colours, and number pattern etc. This inflexibility is increased with age. Then it becomes a compulsive phenomena and the child becomes distressed even if small changes are made in the environment.

Stereotyped body movements like hand-flapping, finger flicking, swinging, rocking is more or less present in them. They are also fascinated with movements (spinning wheels of toys etc). They also show non-flexible adherence to follow particular rituals (e.g. touching compulsively when meeting a particular person).

Besides these behaviours few other problems are also seen. Among them physical aggression is common. Physical aggression involves hitting, pushing, spitting etc. Konstantareas and Homatidis (1989) reported about such aggressive acts in thirteen out of forty four autistic children with age ranging from two to twelve years.

Temper tantrum is common in them. Thirty percent of autistic children displayed self-injurious behaviours (Konstantareas and
Homatidis, 1989). Self-injurious behaviours includes eye poking, scratching, pulling of hairs etc.

These behaviours occurred possibly because of their inability to communicate their needs to others. As they already have so many problem behaviours and in addition to this, when they have to confront with additional problems like sexual needs and desires, seizures in adolescence etc, their life become miserable.

Among the most frequently observed behavioural problems is physical aggression. This may include pushing others, hitting, spiting, biting self or others and throwing objects. Konstantareas & Horiatidis (1989) reported about such aggressive acts in 13 out of 44 autistic children aged 2 to 12 years.

However, these types of physical aggression are noticed in developing children as well. But after six years of age with the mastery of language and increased cognitive abilities they learn to evaluate the consequences and develop alternative solutions. This ability to generate alternative solution lacks in children with social handicap as also in autism (Spivak & Schure, 1974).

Aggression in children with autism is frequently related to their frustration over their inability to communicate. Also, lack of their own and others feelings prevent them from learning the consequences of aggressive actions and poor social judgment interferes with their ability to develop more coping strategies (Schopler et al., 1980).
Lack of response or non compliance to discipline takes the form of behavioural problems in autism. To control this, the techniques frequently used with other children such as scolding, spanking etc are not effective.

In preschoolers with autism, the typical lack of response to parental commands is exacerbated by the children’s difficulty understanding what is being asked. In some cases inability to perform the behaviour being asked of them further complicates the situation (Schopler et al., 1993).

Lack of initiative and frequently excessive dependence on the external cues is a source of concern for parents of children with autism. They appear to lack motivation as they wait for others to provide prompts or cues in order to initiate or sustain any activity. The lack of initiative is frequently related to the inability to organize and sequence behaviour. Their low arousal level, poor concept about time and lack of understanding to future rewards further complicates the issue. Again their social deficits reduce the effectiveness of many typical sources of motivation such as pleasing others or social praise.

Temper tantrum is a common problem with children with autism. This is generally observed in developing children mostly when they are tired or frustrated. In autistic children it is observed that 30% of them displayed self-injurious behaviours (Konstantareas & Homatidis, 1989). Screaming without apparent cause, destroying toys and objects are other forms of tantrums noted in these children. These tantrums are because of their tendency to get
easily frustrated and inability to communicate their needs to others. Their unstable emotional state may increase the likelihood of becoming aggressive.

Behavioural problems include harmful actions towards self and others as well. Self-injurious behaviours include head banging, eye poking, hair pulling, biting, etc. Throwing objects, damaging furniture, tearing threads, hitting and pushing others are some of the problems prominent in children with autism.

It has been observed extensively that autistic children indulge themselves in some particular object which is mostly unusual in its type, like thread, rubber band etc, or in a particular part of an object like the wheels of the car, and takes obsessive interests in it.

Many of them display repetitive motor movements, which are almost mechanical repetitions of posture and movement and are called stereotypes. Repetitive behaviours are considered as one of the many behavioural problems by Kanner (1943) in his original paper as well as by Diagnostic and Statistical Manual of American Psychiatric Association (1994). Stereotyped movements include hand flapping, rocking, head banging etc. It has been reported after several researches that these activities are displayed when sensory or social stimulations are intense or for self-stimulation. To be elaborative these movements are evidenced in two situations: one, when child perceives the sensory input to be too intense as if some sort of overflow of sensation tends to occur; second, these movements serve the purpose of relaxation through
a significant reduction in the amount of stimulation entering the conscious awareness. So, these movements are pleasurable to them. When they engage themselves in such activities for a prolonged period, the rhythmicity seems to serve the purpose of shutting down access to any other form of stimulation. Thus, it becomes difficult to get the attention of an autistic child who is rocking or flapping in this manner.

One of the most significant facts behind problem behaviours of autistic children is their inability to modulate sensory input (Orintz, 1983). The theory on sensory dysfunction was first developed by A. Jean Ayres (1972), an occupational therapist; Dr. Ayers defined Sensory-integration as "the organization of sensation for use".

Sensory-integration (SI) is the neurological process that organizes sensory information from our body, and environment and allows us to use our body to respond effectively. For most children SI develop in the course of normal development but for some children it does not develop as efficiently as it should. The child with this problem registers sensory information without screening non-essential sensory information and is considered to be distractible or uninhibited. This makes the world "....weird, like being tuned into 40 channels", to the child. They are found to be either hypo or hyper sensitive in modulating different sensations. Orintz (1932) maintained that sensory disturbances are highly common specific to autism. There is a varying level of responsivity to sensory stimuli in all modalities, which cause them to be hypo
or hyper sensitive. A given stimulus may be totally ignored or responded to in an extreme fashion. This is then manifested in form of stereotyped movements.

The underlying neurological abnormality is postulated to be dysfunction of central vestibular connections. The sensory inputs get distorted in vestibular medullary level. The distorted data then, is sent to thalamic structures and then to the cortex. A series of neural loops, which are involved in the process, gets affected by the processing dysfunction.

Problem behaviours are the first indications of sensory dysfunctions due to which the child may lack flexibility, be explosive or show extreme irritability.

Whatever may be the reasons behind these varied number of behavioural problems observed in autistic individuals, the fact remains that they are highly distressing for the parents and of course, inhibitory in the path of their management programs. These behavioural problems thicken the walls of autism and make them impenetrable to the extent that it becomes impossible to reach them through intervention strategies. Therefore there is a need to design the management program in such a way that these problems are reduced so that these children can extract maximum benefit from their total intervention program.

Epilepsy

Autism has the highest co-morbidity with epilepsy. ‘Epilepsy’ has been generating considerable interest and arousing curiosity,
revulsion and sometimes fear in the world over a considerable period of time. This organic brain disorder leading to behavioural, cognitive and affective changes in the individual has been baffling people for centuries. Epilepsy knows no barrier of nationality, caste, class, creed, race or sex. It affects not only the epileptic individual but also his family members and all those who are close to him. Even a bystander watching an epileptic fit cannot help but get affected by it.

Great historical figures have been known to have suffered from this disorder---Julius Caesar and Napoleon being two well known examples.

Epilepsy is a condition in which the patient suffers from recurrent spontaneous seizures. It is a disturbance in the Central Nervous System function resulting from excessive neuronal discharge and manifested by recurrent stereotyped behaviour. It is a transitory disturbance of brain function that develops suddenly, ceases spontaneously and is likely to recur. The form that this disorder takes depends on the site in the brain in which it originates the extent of the brain area involved and other factors.

The primary symptom of epilepsy is the epileptic seizure, but not all persons who suffer from seizures are considered to have epilepsy. An epileptic seizure is a result of transient electrical instability in some cells in the brain, which sometimes triggers an 'electric storm' that spreads to all parts of the brain. However, it is not uncommon for otherwise healthy persons to have a seizure during a temporary illness or following exposure to convulsive
agents. The label epilepsy is applied only to those patients whose seizures appear to be generated by their own chronic brain dysfunction.

Epilepsy may be diagnosed by the use of the Electroencephalogram (E.E.G), which is the most helpful laboratory test in the diagnosis and management of epilepsy. Approximately, 85% of epileptics show abnormalities in the interictal record, provided that the test includes activation by hyperventilation, photic stimulation, sleep and nasopharyngeal or sphenoidal recordings. However, the abnormal in the interictal record are different for the different types of epilepsy. Moreover a normal E.E.G does not exclude the diagnosis of epilepsy and an abnormal E.E.G does not itself make a diagnosis of epilepsy. Other important laboratory tests in the evaluation of epilepsy include plain skull X-rays, blood count and chemical analysis to rule out metabolic disorders. In many cases, brain scan, computerized tomography of the brain and occasionally arteriography may be indicated.

Epilepsy may be treated by drugs (e.g., phenobarbital, carbamazepine, phenotoin and valproic acid), surgery, psychotherapy, hypnosis, biofeedback techniques, diet control and management of the lifestyle of the patient (i.e., avoiding aggravating factors such as lack of sleep, hypoglycaemia etc.) However, parental involvement and support are a must in the success of any treatment for epilepsy.
Types of Epilepsy

In 1969, the Commission on Classification and Terminology of the International League Against Epilepsy introduced a classification which received widespread support. This classification is essentially based on the clinical manifestations of the attacks.

1. Partial seizures (seizures beginning locally)

2. Generalized seizures (bilaterally symmetrical seizures without focal onset)
   - Grand mal or tonic-clonic seizures
   - Petit mal seizures
   - Bilateral massive epileptic myolcones
   - Infantile symptoms
   - Clonic seizures
   - Tonic seizures
   - Atonic seizures
   - Akinetic seizures

3. Unilateral seizures (Or predominantly)

4. Unclassified seizures (Due to incomplete data)
   1a. With elementary symptomatology
i. with motor symptoms

ii. with special sensory or somatosensory symptoms

iii. with autonomic symptoms

iv. compound forms

1b. With complex symptomatology

i. with impairment of consciousness only

ii. with cognitive symptomatology

iii. with affective symptomatology

iv. with psychosensory symptomatology

v. with psychomotor symptomatology

vi. Compound forms

1c. Secondarily generalized

Intellectual deficits play a significant role in psychosocial comorbidity of children with epilepsy. Early education intervention is critical.

Epilepsy and Autism

There are many co-morbid conditions that exist alongside autism spectrum disorders; one of these common co-morbidities is epilepsy. According to a study by Gabis et al., (2009), 40% of their autistic study participants also had an epilepsy diagnosis.
The study, "Autism and epilepsy: Cause, consequence, comorbidity, or coincidence?" also suggests that those who are more severely affected with autism have a higher incidence of epilepsy.

Autism can present in two ways. In most autistic children, the difference can be recognized from an early age. They move and cry less, they do not like to be held and they are quite happy to be left alone. In approximately one-third of children the development proceeds normally until the second year of life. Then they gradually regress into autism usually in association with emotional or physical trauma and with seizures. Kanner reported one case of epilepsy among his 11 children. The prevalence of epilepsy among autistics is much higher than the normal population. There is also an increased prevalence of abnormal potentially epileptogenic activity in children with autistic spectrum disorder. About one in four autistic children develop seizures at puberty.

Epilepsy is often associated with global central nervous system disorders like cerebral palsy, mental retardation and autism. In autistic children, the risk of seizures increases if they have certain specific neurological disorders like neurofibromatosis, tuberous sclerosis, phenylketonuria (untreated). Children with symptomatic infantile spasms (sudden generalized muscle contractions usually beginning between the ages of three and eight months) tend to develop both epilepsy and autism. Complex partial seizures or temporal lobe epilepsies show different clinical features in
children of different ages. The general course tends to be favourable. Adverse course may be seen in children with perinatal complications, spike-wave complexes in the EEG and those with psychomotor and psychosensory seizures. Hashimoto et al., (2009) reported a tendency for epileptic foci to occur in the frontal region in autistic children and they suggest that frontal dysfunctions may be important in the mechanism of symptoms of autism.

An important study was conducted by Steffenburg, Steffenburg and Gillberg (2009). They found that partial seizures were more common and generalized seizures less common in autistic spectrum disorder (ASD) group compared with non-ASD group. Seizure onset was later in the ASD group. Established etiology was more often present in the prenatal period than in the peri- or post-natal periods in the ASD group. There was no increase neither in the prevalence of active epilepsy and learning disability nor in the rate of autism with active epilepsy and learning disability in children born between 1981 and 1986 compared with those born between 1976 and 1980, indicating no statistical association with the general measles-mumps-rubella (MMR) vaccination introduced in the early 1980s.

The relationship between epilepsy, language, behaviour and cognition is not well understood. Tuchman and Rapin (2009), in their review in the Lancet concluded that there is an increased but variable risk of epilepsy in autism. Age, cognitive level and type of language disorder account for the variability in the
reported prevalence of epilepsy. In some cases the association between the two conditions may denote common genetic factors.

The previously mentioned Mozart effect has shown a positive effect upon epileptic symptoms.

**Music and brain**

To understand the efficacy of music therapy it is essential to understand the concept of psychoacoustics i.e., musical perception.

It is essential to understand how sound waves are received by the human body. Sound waves travel like the ripples on the surface of a pond when one throws a pebble in. They contact the human body in an attempt to create vibrations or tingling sensations on different parts of our body. The thinner the layer of molecules, the easier it becomes for sound waves to displace at the same rate. Therefore, the most sensitive receptor to the movement of sound waves is the tympanic membrane (eardrum). It is interesting to note that eyelids and fingertips are among the most sensitive receptors to certain frequencies of sound reported by people with hearing loss.

The ear is the sense organ that picks up sound waves from the surrounding air and turns them into nerve impulses that can be sent to the brain. The sound waves carry lots of information - language, music, and noises - all mixed up together. The task of the ear is to turn the signals in these waves of bouncing air
molecules into electrical nerve signals, while keeping as much of the information in the signal as possible.

Exposure to music modifies the structure and function of the brain.

**Brain Waves:** Research has shown that music with a strong beat can stimulate brainwaves to resonate in sync with the beat, with faster beats bringing sharper concentration and more alert thinking, and a slower tempo promoting a calm, meditative state. Also, research has found that the change in brainwave activity levels that music can bring can also enable the brain to shift speeds more easily on its own as needed, which means that music can bring lasting benefits to the state of mind, even after one has stopped listening.

Researches have proved that patients of bonafide brain disorders like dementia respond well to music therapy:

**Berger and Gabriele (2004)** compared 18 patients of dementia to their controls based on age, gender, diagnosis, dementia severity, living arrangement and medication, pre and post musical intervention continued for 2 years on a weekly basis. The experimental group showed significant reduction on behavioural and psychological symptoms.

**Noda, Ryo (2004)** proved that Musicokinetic therapy initiated within 6 months of brain damage show good results of recovery.
Sherratt and Thornton (2004) conducted a qualitative review of 21 published articles of clinical studies looking at the effects of a variety of music activities on the emotional and behavioural responses in people with dementia. They found out that music has a range of applications in dementia care.

Kaplan (2003) presented a discourse on aspects of sounds, song, music, and epilepsy, rather than a comprehensive review of all aspects of each constituent part. The recognized connection between neurological disease and sound/music is perhaps most apparent in persons in whom music appreciation is most important. The interaction of music and brain function ranges from the observation that particular musical abilities may be lost following strokes or other pathologies in the temporal lobe.

Despite the prevalence of musical awareness, expertise, and epilepsy, musicogenic epilepsy (ME) probably remains an under recognized condition, with a suspected low prevalence of one in ten million. The pathological musical play on emotions and behaviour can come in the form of patients with no other trigger for seizures. Functional imaging while supplementing clinical observation and EEG sheds new light on the nature of this relatively long latency to seizure onset in ME argues for a higher auditory association cortex level of neuronal integration and malfunction underlying the triggering an epileptic seizure.

So hereby we accept that exposure to music therapy does alter brain functioning.
The autistic brain

It has been said that autism is a bonafide brain disease.

Schultz (2000) has studied a brain region called the fusiform face area, which they believe is involved in "storing social knowledge." MRI studies show that this area, which normally lights up when a person processes faces, is impaired in autistic individuals.

The amygdala, known as the emotional centre of the brain, appears to be less active in autistic people than in others. When an autistic person views images of emotional faces, for instance, the pathways that normally light up remain dark.

In a brain region known as the prefrontal cortex, certain areas are known to play a role in empathizing behaviours. These areas
become more active when a person is figuring out what people are thinking or feeling. MRI studies have shown that in autistic people, the prefrontal cortex is less active in these tasks.

The autistic brain is, on average, larger and heavier than a normal brain.

In 1999, Baron-Cohen and his colleagues found that autistic individuals reading facial expressions had less activation in the front part of the brain—and no activation in the amygdala—compared to others, who showed a lot of activity in both regions.

Nerve cells in one region of the brain, the superior temporal sulcus (STS), light up when another person (or animal) looks at you. Ordinarily, connections from the STS to the amygdala are activated when a person tries to understand what’s going on in the mind of another. In autistic people, this pathway may be missing or incomplete.

Music therapy modifies the brain. So, it can be assumed that music therapy will also be able to modify the autistic brain. An autistic person’s love for music is phenomenal (Kaplan & Saddock, 1995). It can be said that the brain areas responsible for music appreciation are either intact or more developed in children with autism. The dark and long tunnel through which a person with autism completes his journey from the womb to the grave can best be illuminated by music. Music is probably the strongest connection between an autistic world and the real world. As Aldus
Huxley had once said - 'After silence that, which comes nearest to expressing the inexpressible, is music.'

11 years old Ms. Y who is a very beautiful girl is flapping and rocking when she sits on the chair. She prefers to sit alone in a corner of a room, rocking back and forth while flapping her hand as if she is trying to fly. She smiles and cries but not for any rhyme or reason. She rarely responds while people are calling her; she is unable to maintain eye contact while talking to others or does not smile at faces, or cuddle when picked up. She fails to develop normal language. Even she has very immature grammar. She repeats back when she is asked 'where do you stay?' she says 'where do you stay?' She speaks in a singsong way. The singsong is in such perfect rhythm and melody that she can shame well-trained musician. She knows all her therapists by a specific rhyme. All the therapists use some rhyme in their sessions. Ms. Y recognizes the therapists by the first song they use. When she sees them she sings them.

Numerous examples can be given of an autistic person's special connection with music. Children with autism have difficulty in focusing upon a particular sound in the environment. Since music is a good sound it's attention value is much higher than its competitors. As a result children can immediately focus upon it. This would give them a sense of relief because it immediately stops the additional noise inside the brain and releases them from their frantic efforts of auditory integration. It takes place naturally.
So persons with autism are forever seeking musical relief from their disruptive symptoms. Music is genuinely therapeutic for persons with autism.

**Music therapy in the West**

In the western world numerous studies have been undertaken with music therapy on persons with autism.

Autism is accepted as a communication disorder. Music therapy has been used to usher better communication in many groups especially in the clinical population. Martin & Lori (2004) undertook a study at a long term care facility in southern Ontario, Canada. Nursing home residents were exposed to a drum circle programme. Data analysis resulted in identification of 4 behavioural categories:

- Empowerment
- Bringing out
- Bringing together
- Community resonance

Result obtained showed that vibrotactile instrumental rhythm playing is a positive experience for the majority of the participants, enhancing communication, providing an opportunity for mastery and promoting communal music-making.

This study gives us a pointer as to music therapy as a facilitator of communication skills.
Krout and Hospice (2003) care seeks to address the diverse needs of terminally ill patients in a number of physical, psychosocial and spiritual areas. When loved ones are anticipating the patients impending death, they may find it difficult to express feelings, thoughts and last wishes. Music therapy is a service modality that can help to facilitate such communication and sharing between the family and the patient, who is actively dying, while also providing a comforting presence. Music therapy as a way to ease communication and sharing between dying patient and their loved ones is discussed in this article.

This study emphasizes how difficult feelings also can be communicated through music.

North, Tarrant (2004) saw several studies indicate that mood can influence the likelihood of individual demonstrating instances of helping behaviour, and one previous laboratory study has indicated that music can be used to bring about manipulations of mood to such an end. To investigate this in a naturalistic setting, 646 users of a university gym were played either uplifting or annoying music while they worked out. Upon completion of their workout they were asked to either sign a petition in support of a fictitious sporting charity (i.e., low cost task). Responses to the petition-signing measure indicated a ceiling effect with almost all participants offering to help more on the high-cost, leaflet-distributing task than did annoying music.
So, this study shows how music can influence mood and hence relatedness. This makes us draw the connection that improvement in relatedness will also help persons with autism.

Thompson (2004) conducted three experiments which revealed that music lessons promote sensitivity to emotions conveyed by speech prosody. After hearing semantically neutral utterances spoken with emotional (i.e., happy, sad, fearful, or angry) prosody, or tone sequences that mimicked the utterances' prosody, participants identified the emotion conveyed.

This study brings us to the fact that music is a language by itself. Since persons with autism are receptive to music, it can be assumed that they will find musical language easier to process.

The Mozart Effect is found to have therapeutic results (Jenkins, 2000). It has worked wonders on people with epilepsy, dementia, Alzheimer's disease.

Case studies have been reported using the Mozart effect to heal autistic symptoms but there is a dearth of scientific studies of the Mozart effect solely upon the autistic population. So, the present study has taken the task of studying the Mozart effect upon the autistic population.

Mozart effect has been found to reduce the intensity and frequency of epileptic seizures.
Indian Classical Music

The origins of Indian classical music can be found from the oldest of scriptures, part of the Hindu tradition, the Vedas.

The Sāmaveda, one of the four Vedas, describes music at length. The Sāmaveda was created out of Rgveda so that its hymns could be sung as Sāmagana; this style evolved into jatis and eventually into rāgas.

Indian classical music has one of the most complex and complete musical systems ever developed. Like Western classical music, it divides the octave into 12 semitones of which the 7 basic notes are Sa Re Ga Ma Pa Dha Ni Sa, in order, replacing Do Re Mi Fa Sol La Ti Do.

Main genres

The two main streams of Indian classical music are:

- Hindustani classical music, originally from North India
- Carnatic music, originally from South India

The present study resorts only to Hindustani Classical music for therapeutic use.

Hindustani music

Khayal and dhrupad are the two main forms of Hindustani music, but there are several other classical and semi-classical forms. Players of the tabla, a type of drum, usually keep the rhythm, an
indicator of time in Hindustani music. Another common instrument is the stringed tanpura, which is played at a steady tone (a drone) throughout the performance of the raga. Other instruments for accompaniment include the sarangi and the harmonium. The prime themes of Hindustani music are romantic love, nature, and devotionals.

The performance usually begins with a slow elaboration of the raga. This can range from long (30-40 minutes) to very short (2-3 minutes) depending on the style and preference of the musician. Once the raga is established, the ornamentation around the mode begins to become rhythmical, gradually speeding up. This section is called the *drut* or *jor*.

**Music therapy in the East**

India has a rich heritage in music.

The Vedas symbolized music as a means of realizing God.

Indian classical music has a long history in having powerful effects upon the audience. *Rāga*, in the Sanskrit dictionary, is defined as "the act of colouring or dyeing" (the mind in this context) and "any feeling or passion especially love, affection, sympathy, vehement desire, interest, joy, or delight". In music, these descriptions apply to the impressions of melodic sounds on both the artist(s) and listener(s). A *rāga* consists of required and optional rules governing the melodic movements of notes within a performance. Different *Rāgas* have different effects.
Rabindranath Tagore (1914) in his essay ‘Sangeeter Mukti’ has described the different Rāgas to create different moods.

He emphasizes that Indian Rāgas have a universal appeal. It speaks not only about human emotions but also about the universal phenomena.

The Rāga Bhairav is seems to be the first awakening of the sky.

Paraj is the tired and drowsing night.

Kanhada seems to be the mysterious lover lost in darkness.

Bhairavi is the loneliness of the universe.

Multan is the tired exhalation of a sultry summer afternoon.

Porvi seems to lament the loss of her lover in the evening.

So, the melodies the Indian Rāgas generate create a specific mood for the listeners.

Some Therapeutic Rāgas

Some rāgas like, Darbari Kanhada, Kamaj and Pooriya are found to help in defusing mental tension, particularly in the case of hysteric. For those who suffer from hypertension, rāgas such as Ahirbhairav, Pooriya and Todi are prescribed. To control anger and bring down the violence within, Carnatic rāgas like, Punnagavarali, Sahana etc. do come handy.
This author, Dr. T V Sairam, experimenting on the impact of rōga on mentally-retarded (MR) children has noticed that it is the right combination of rhythms and tempo, which also affect the quality of a rōga.

Not only psychological impact, but also somatic or physiological impact of ragas has come to light in some recent works (Sairam, 2004).

For instance, stomach-related disorders are said to be cured with some Hindustani Rōgas such as Deepak (acidity), Gunkali and Jaunpuri (constipation) and Malkauns or Hindolam (intestinal gas and for controlling fevers). Fevers like malaria are also said to be controlled by the rōgas like Marva. For headaches, relaxing with the rōgas like, Durbari Kanada, Jayjaywanti and Sohni is said to be beneficial.

It is necessary that a group of exponents in Indian ragas join experts in medicine to help evolving a scientific system of raga therapy for the most common illness of the modern times: stress and stress-related disorders.

The need for Music therapy for people with Autism

Persons with autism are inevitably drawn to music (Kaplan, 1995). This is a preference they show above anything else. There are people with autism who develop a musical ability before speech. There is a mystic connection of autism and music.
A few examples will make the above assumption clear:

Master S. lost his mother in labour. He is diagnosed of ASD. He also suffers from epilepsy. He is 10 years of age. He has to be coaxed to give an eye contact. He does only need-based communication in monosyllables. As expected, he does not take any interest in his peer group; neither has been able to imbibe age-appropriate social or academic skills. But he is able to recognize any Raga being played. Not only is he able to pin point the raga, but also the musician.

Ms. T is diagnosed of ASD. She is 13 years of age. She is being able to cope up academic demands of her school, though her interaction with the peer group is limited. But on the annual day she has something to offer. She presents the most popular song of that year in front of the whole school in perfect rhythm and melody. She has been doing it for the past 8 years and receiving a standing ovation each time.

Ms. A, 9 years of age is diagnosed of autism. She has not developed speech but can hum any song she has heard in perfect rhythm.

So we can see there is a deep link between music and autism.

It seems persons with autism are close to music and can be reached with the help of the same. Music seems to be a connection between the real world and the autistic world.
The present study thus aims to reduce autistic symptoms with the help of music therapy.

In the western world the music revolution has already started. Persons with autism have been seen to respond to music therapy. Though there is a rich musical heritage in India the movement is yet to begin.

Persons with autism like familiarity. So, it is assumed that they would respond better in Indian tunes than to western ones, since being Indians they are more familiar with the later.

So, the present study aims to find the Raga able to heal autistic symptoms.

The Mozart effect is a tried and tested musical remedy. It is used as a fallback as well as benchmark.

It is assumed that co-operation, sitting tolerance, listening skills as well as instructions taking will improve with music therapy. This will in due course show improvement in socialization and communication and reduce problem behaviour.

So, the purpose of the present study is to establish the effect of music, particularly finding out the tune from the Hindustani raga which may have positive effect on the autistic brain. Moreover, as epilepsy is a co morbid feature of more than 50% cases of autism. The present research again purports to throw light on this particular issue and whether there is any special effect of music on autistic brain with epilepsy.
So, the objective of the present study is two fold. At first, to find out the suitable Hindustani r\textsuperscript{a}ga/r\textsuperscript{a}gas to intervene in autism management and comparing the effect of western music with it. Secondly, the effect of these two types of music on different abilities of autism.

So the specific objectives for the second broad objective are:

1. To identify appropriate Hindusthani R\textsuperscript{a}ga/s to be use for therapeutic purpose for the persons with autism.

2. To determine the effect of the musical intervention provided upon some functions of persons with autism.

3. To determine the effect of specific Hindustani r\textsuperscript{a}ga for the improvement of some functions of persons with autism.

4. To determine the effect of western tune music appropriate for improvement of some functions of persons with autism.

5. To compare the effect of western and eastern music on some functions of persons with autism.

6. To determine the effect of music upon some functions of persons with autism of different age groups.

7. To determine the effect of music therapy upon the severity of autism as revealed through some functions of the persons with autism.
8. To determine the effect of music therapy upon the persons with autism with and without epilepsy.

The improvement would be considered in terms of

a. Reduction of problem behaviour

b. Improvement in communication

c. Improvement in socialization