



Silence and Science

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Abstract

Silence is versatile and it holds an immense power and a great source of strength. Understanding of silence is a heterogeneous phenomenon having many varieties. The movement of universe and the heart beat are a kind of perfect Rhythm of nature which is an universal time of perspective. The gap in between this heart beat (lup- tup) is silence which is a part of rhythm and it is a measured time. Music is a science of sound where silence is represented by rest markings that denote moments in which nothing is sung or played. In spirituality it is stillness both mind level and body level. Silence in communication happens when you do not use words. Rest or Silence is an inseparable part of any poem or musical composition. Music contains melody, harmony, timbre, pitch, silence and form of structure as its elements. Pauses or silences are already constructed and rendered as musical composition. The added dimension of pause enhances the music which are an integral component of many musical forms. Rhythmology is a science of sound with respect to sound beats or tala. Rhythm is measured in duration of the sound and silence. This kārvaī is a amalgamated form of markings like colon, semicolon, dots, sollukattu can produce wonderful rhythmic patterns which are expressed in dance in the form of Jathis and rhythmic phrases like mohras, furans and thirmanam in percussion instruments.

Keywords: Physics, meditation, kārvaī, musical forms, Rhythm, Dance, Films.

INTRODUCTION

Silence holds immense power and it has a great source of strength. Silence is versatile. Silence is maintained in many places like Educational Institutions, Courts and libraries. Silence is the main aspect of discipline and respect. Hospitals maintain silence on health grounds. Silence plays a key role in creating and maintaining the rhythm and melody for a piece of music. Silence activates the inherent strength that can be achieved through meditation. It is suggested that by embracing silence we can tap into our inner reserves of strength and resilience. Silence in communication happens when you do not use words during conversation. Silence is recognised in many legal systems of many countries.

Nature and silence

The movement of universe is in a perfect rhythm of time of Nature. The heart beat Lup - tup is a kind of perfect Rhythm of nature which is an universal time of perspective. The gap in between this lup- tup is silence which is a part of rhythm and it is a measured time. There are evidences listening to sound of nature relives stress. The sound will be audible only after a gap or silence. Some best examples are thunder sound after lightening, a wave sound after another wave in the ocean.

Types of silences:

There are many types of silences or pauses. A pausing that reflects an understanding of silence is a heterogeneous phenomenon. They are disengaged silence, emotional silence, interactional silence, reflexive silence, expressive silence, associational silence and mnemonic silence.

Silence and Quotes

Silence helps us to understand ourselves. It tunes our inner wisdom and creativity. Silence can also be used as a tool to practice self-control.

Mother Teresa says “We need to find God in silence. He cannot be found in noise or restlessness. God is a friend of Silence. The nature trees, flowers, grass grows in silence. The star, the moon, the sun moves in silence.”

Pythagorus says “A fool is known by his speech and a wise man by silence”.

Thomas Carlyle says “Speech is Silver and Silence is Golden.” In other words, both are precious with silence considered more valuable. Researchers found it more relaxing than listening to music.

Leonardo Da vinci said “Nothing strengthens authority so much as Silence.”

Silence and Spiritual Science

Organising the mind and the body to stillness with any thought is the first step for spiritual development. Silence considered to be the highest form of sadana or practice to attain moksha in spiritualism. In Buddhism description of silence is implied as a feature of spiritual enlightenment The **Saint Arunagirinadar** records in his Khandar Anubūdhī about silence in the 12th song as summā iru (be silent)

“Summa iru sollara nindralume Ammā porulondrum arindilane” Khandar Anubūdhī -12.

In another song he stresses speechless nature in 43rd song as Pesā anubūdhī.

“Aasānigalam thugalāinapin Pesā anubūdhī Pirandaduve “- Khandar anubūdhī - 43. This can be achieved by high spiritual blessing from the supreme.

Ramana Maharishi said “The only language able to express the whole truth is silence”. The verses in Aksharamana Mālai says “Solladhu solli nee sollara nillendru Summā irundhāi Arunachala “Here the importance of silence is highlighted by Lord Arunachala. In early periods the human maintained silence by living away in forests and mountains.

Silence in Science of Meditation

In the history of Buddha meditation Buddha teaches the spiritual leaders to maintain “Noble Silence” (Anālayo – 2017). In Buddhism description of silence is spiritual enlightenment. This represents a meditative state called Dyāna which is very common phenomena in eastern countries particularly in India. It is an improved level of consciousness achieved by devoid of thoughts and establish a stillness in mind. Researches on silence shows pulsating micro structural changes in the uncinated process in Vertebra. Uncinated process is located on the margin of superior endoplates of the cervical vertebral bodies. (C3, C7)

Silence in Education

Silence encourages discipline and concentration. The focus and concentration on the other hand enhances the learning. It cleans the mind and make it calm which is the preparatory step for learning. Peace and Silence calm the brain and loosens the roots of anger, greed and fear. It will create a space for reflection, creativity and healing. The students who are practicing meditation regularly for a long time show high resilience score, improved sleep, happiness and Self-confidence.

Silence in the Court of Law

According to the law the defendant does not need to say anything. This is the fundamental right of human to maintain silence. In Police Interrogation silence is a legal protection for the people. This is recognised in many legal system of many countries. The Judges traditional phrase “order or Silence is a request for silence. It can be considered as a discipline which should be maintained all over.

Silence in Library

From a very long period reading and research have been viewed as solitary activities of human. Libraries restrict the noise and sounds to protect the concentration of the library users. It can also be considered as a discipline which should be maintained in all libraries. This is recognised and strictly followed all over the world.

Silence in Medical Science

Quiet and noiseless environment improves the healing of the patients in Hospitals in a fast manner. The silent practice of sleeping and resting enhances the patients’ health. Silence has significant Psychological and mental health advantages which gives greater sense of peace. Peacefulness and silence decrease the anger, anxiety and fear for many patients. On the other hand, noise increases their stress and irritation will make them mentally upset. Human body will react to signals even when they are in rest or sleep. Researches says that Amygdala, a small almond shaped structure seen in the temporal lobe of the brain will get disturbed even in rest or silence through emotions. Though it is very small it is carrying out a big job. It is the main and important processing unit of emotions. It can be made to ease by meditation and breathing exercise. The power of silence is it can stimulate new cells growth in the brain, improve memory and release tension in the brain and the body.

Silence and Physical science

In the world the Time seems to adhere universal tick- tock rhythm. The gap in between this tick – tock is silence which is a measured time. Scientist Einstein discovered that Time is relative. Latest researches say Silence is not deafening but it is something which can be literally heard. The philosophers and Psychologists say Silence distort people’s perception of time. The Frequency of Silence can be determined by the frequencies lower than 20Hz which cannot be heard by an average human. So, Silence is also a sound which can be observed through touch sense or vibrations.

Silence and Visual Art science (Films)

Silence is very common in films and movies to convey emotions. When sounds are eliminated, it is called absolute silence which helps to build a tension in films among the audience. Silence is the best tool in horror movies. The silence is so apt for death news and bad news which are widely used in movies and all Medias. While processing heavy information silence stands first. Silence helps to portrays clearly a frozen character or an emotional shock. The effects of silence are unbelievable. Comedy King Charles Chaplin is known for his acting in Silence. He will use silence at crucial moments.

Silence in Sound of Science: (Music) Music is a science of sound where silence is represented by rest markings that denote moments in which nothing is sung or played. But Silence in it is a calculated time.

Silence in poems or music compositions:

Rest or Silence cannot be separated in any composition. It is the one which indicates the beginning and the end of the music composition. All the Silences are not similar so the silence need more attention to understand. A poem is coined with Rhythmic words. The rhythmic pattern is called chandam which when repeated gives an aesthetic sense to that composition. The familiar silence seen in most of the poems are the ending of the poem. Similar silence is observed in music also. One of the main reasons to use pause or silence is to make the reader or listener to get a clear picture. The pause or silence at a right place will convey the meaning perfectly.

Silence in music (Melody)

Music contains melody, harmony, timbre, pitch, silence and form of structure as its element. In karnatic music the silence is described as Kārvai. This is the gap between two notes or sounds.

The most commonly used symbol in music is pause. In western music it is called rest. It is the opposite of a notes. Absence of sound in music for a particular period of time is silence. The length of the silence is directly proportional to the note value, in classical music notation silence is represented by rest markings that denote moments in which nothing is sung or played. A pause or Kārvai is the sustaining notes.

Planned or Pre-set Silence in music compositions

All musical forms have definite structure. It is the basic foundation on which the letters, the words, time restricted pauses in the form of kārvai are constructed. The pauses or silences already constructed as a pre-set and rendered. Structure is the main aspect of musical forms The musical forms like gitam, swarajathi, varnam, kriti, kirithana, Padam, javali, daru, tillana are composed in traditional structure where pause or kārvai is an unavoidable one.

1. A musical form - Gitam with Silence

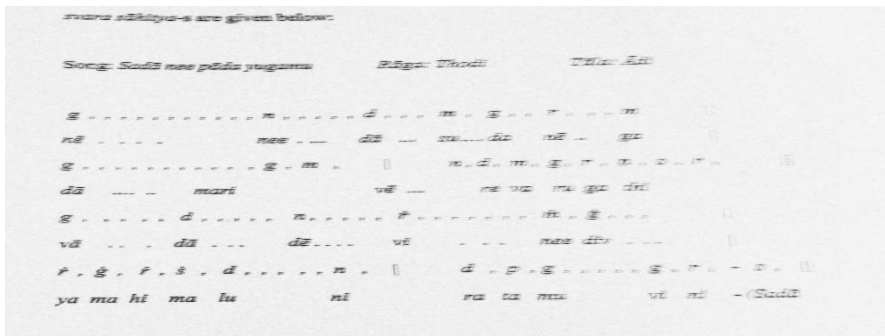
Analekara – Suddhasaveri Ragam – Tripuda Talam			
analekara	unni bollati	sakala sastra pu-	rana dhi nam
tala dhi nam	tala parighatu	re
... .. .	setu vaha	parighatam nam	jata juta
sakala sastra pu-	rana dhi nam	tala dhi nam	tala parighatu
re	setu vaha
parighatam nam			

Gitam is a very simple composition which comes under abyāsa gāna. Here the silence is the elongation of swara or the letter of the word. Kārvai in this musical form is denoted as silence. Some gitams like ‘Analekara in Sudha saveri “and “Mandara darare in Kamboji” are constructed with lengthy ahāram which can be considered as kārvai. In the above Analekara gitam in the word “Parighatu re” the last letter re is elongated as kārvai.

2. A musical form - Varnam with Silence

In Varnam the swara phrases are constructed with an even flow of swaras and pauses which are the characteristic feature of Varnam. The format of varnam has a well-defined structure which are not changed over years. In all the Varnam the utthanaga part with charam and charana swaram also confirmed to a distinct structure. The charana swaras may differ in number but the structure is similar in each Varnam. The first charana swaram is constructed with many pauses in the form of long kārvais which is one of the important features of varnam. In the below varnam Charanam is followed by

3. Swara sahithya with silence



Swara sahithyam

When sahithya is added to chittaiswara it is called swarasahithyam. It exactly shows the karvai of chittaiswaram without any change. The swara portion of chittaiswara are replaced by words without changing the karvai. So, it is a section of kriti with many kārvaī.

4. Eduppu or Graham with Silence

It is the place of commencement of starting of the song. It is rhythmically designed adding more beauty to the song. It provides an identity for the song itself. There are three types of eduppus. In this the anāgata eduppu shows silence in the form of karvai with timely rhythmic start. The ata tala varna shows best example for this type of start. Many kritis like Banturiti kolu -Hamsanadam, Sriragukula - Hamsadwani, Entharo mahanu- Sriragam of Sri Tyagaraja are best examples for anāgata eduppu.

A kriti in anāgata eduppu

Kriti: gananāyakam raga: navarasa kannada tala: adi

pallavi

1	g , m , m g g , r ,	ya ...
	ga ṇa nā	
	s , , , , ṇ ,	d , , , m , p .
	kam ... bha ..	jām... ya ...
2	s , , , , g , m , m g g , r ,	ya ...
	ga ṇa nā	
	s g g r s , s ṇ	d , , , m , p .
	kam ... bha ..	jām... ya ...
	s , , , , s , g m , p , , p ,	
	ham. ... kā ...	mi ... tha...

5. Silence in Pallavi (A Musical Format)

Letangi Ragam – Trisra Jati Tripuṭa Talam (Khanda-nada)

Note : ♦ All the kriyas of this Pallavi are in Khanda Gati
 ♦ Ettugada is 1 Akshara in Anagatam and Padagarbham is 6 Aksharas

Sahityam : mātā sītā mahī sūtā – mahā mahimānvitā

Laghuvu: Kriya-s (Khanda gati)

1 st	2 nd	3 rd
R G S , , R , G , , M P M D		
mā . tā . , , sī . tā . , , ma hī . su		

Druta-s: Kriya-s (Khanda gati)

1 st	2 nd	1 st	2 nd
P , , , , P M D , , P M G , , R G R S R			
tā ma . hā . . mahi mā . nvi tā . . .			

The best example for already planned silence or kārvaī is the Pallavi of RTP (Ragam Thanam Pallavi) where arudi is followed with distinct kārvaī. RTP is the most complex genre in karnatic music. Purvangam is the first part of Pallavi

line and Uthrangam is the second part of the pallavi line. Arudi is the landing point and the arudi kārvaī is the pause or silence that follows the arudi. *Arudi is the point of division of the two parts of a pallavi and between these two the planned pause is constructed which is also called visrān̄thi or resting time which is the extension of the last syllable of the purvangam.* The kārvaī or pause is calculated in the form of akshara or subunit. During improvisation of the pallavi line the location and the duration of each of these components including the arudi kārvaī must be maintained.

Silence and Rhythmology

Rhythmology is a science of sound with respect to sound beats or tala. Rhythm is a sequence of sound and silences that form a pattern in music. Rhythm is measured in duration of the sound and silence. Sounds are the waves that impact the cells in the ear of the hearer but Silence is not. Silence can release tension in the brain and the body. Researchers found it more relaxing than listening to music. A pause or Kārvaī is a sustaining notes. Rhythmic pause or Kārvaī is the elongation of crucial element that is employed in the creation of these complex pattern. In rhythmic patterns the rhythmic syllables like thā, thom, thai that get elongated. While in singing it is the musical note or swara that gets elongated. The length of this kārvaī must meticulously confirm to the tala in particular to which it was constructed. Silence is used to denote the elongated note that singers hold for the duration of the tala cycle.

Silence in rhythmic patterns

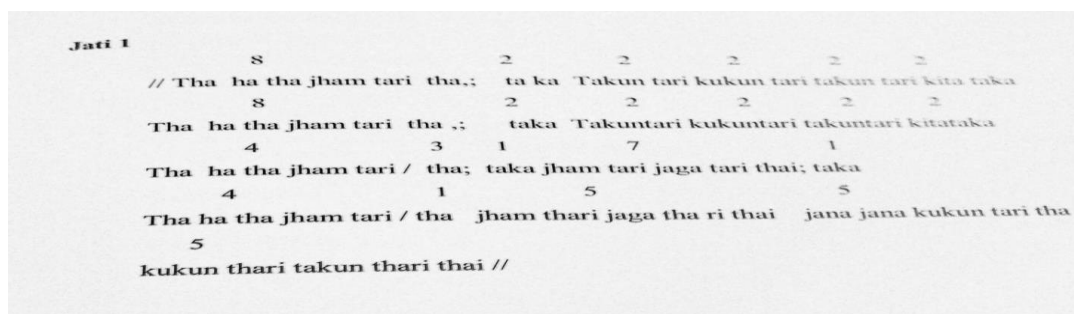
It is the silence or kārvaī that makes the rhythmic sequence more interesting and more complicated to render in multiple speeds. It needs vigorous practice to ensure that the pauses are in prescribed length to reach the end of the tala on time. It cannot be microscopic subunits longer or shorter but it has to be exactly similar. Kārvaī in nadai change seems to be more complicated work. The rhythmic patterns in all talas in chatusra nadai is normal but when the nadai changes to kandam or tisram brilliancy is needed. To make the silence fit into each other tala perfectly, eduppu (starting point) has to be shifted from the start of the tala cycle. This results in the introduction of kārvaī or pause into the rhythmic sequence. The kārvaī in pause elongation in even number of beats is easier than for the odd number of beats (3or 5 or 7) It is very hard to execute the precision in odd numbers.

Silence and Visual Art science (Dance)

Dance is one of the main disciplines which has sections with rhythmic patterns like Jathis, Trikala jathis, thimanam, which are constructed with lot of pauses or silence along with sollukattu (rhythmic phrases).

1. Jathis

Jathi is the rhythmical element constructed with sollukattu. They are the meaningless words like jam, thām, thari, thaka, thom and so on. These jathis are constructed by nattuvanars in dance musical forms like Jathiswaram, varnam, kirthanai, tillana and so on.



2. Trikāla jathis

The trikāla jathis are constructed with long pauses, as these jathis are rendered in three speeds. The first speed of this usually will have more long pauses expressed in kārvaīs. This kārvaī is an amalgamated form of markings like kama, dots, sollukattu can produce wonderful rhythmic patterns which are expressed in dance in the form of Jathis and rhythmic phrases like moras, furans and thirmanam in percussion instruments. The aesthetic beauty is shown out beautifully when the pattern is repeated many times.

Trikālam:
Vijamba-Kālam
 Tha, ; ; ; ri, ; tha, ; ki, ; ta, ; tha, ; ka, ; / tha, ; ka, ; na, ; ka, ; / jam, ; ; ; jam, ; ; ; //
 ; ; ; ri, ; tha, ; ki, ; ta, ; tha, ; ka, ; / tha, ; ka, ; na, ; ka, ; / jam, ; ; ; jam, ; ; ; //

Madhyama-Kālam
 Tha, ; ri, tha, ki, ta, tha, ka, tha, ka, na, ka, jam, ; jam, ; ; /
 ; ; ri, tha, ki, ta, tha, ka, / tha, ka, na, ka, jam, ; jam, ; ; //
 Tha, tha, ri, tha, ki, ta, tha, ka, tha, ka, na, ka, jam, ; jam, ; ; /
 ; ; ri, tha, ki, ta, tha, ka, / tha, ka, na, ka, jam, ; jam, ; ; //

Dritha-Kālam
 Tha, ri tha kitathaka thakanaka jam, jam, ; ri tha kitathaka thakanaka jam, jam, /
 Tha tha ri tha kitathaka thakanaka jam, jam, / ; ri tha kitathaka thakanaka jam, jam, //
 Tha, ri tha kitathaka thakanaka jam, jam, ; ri tha kitathaka thakanaka jam, jam, /
 Tha tha ri tha kitathaka thakanaka jam, jam, / ; ri tha kitathaka thakanaka jam, jam, //

3. Thirmanam

Thirmanam is a jathi or sollukattu which will have a sequence of rhythmical phrases, usually that will be repeated three times. Thirmanam shows many pauses at the end of each segment. It helps to define the conclusion in a clear manner. The kārvai in thirmanam can convey many types of emotions through intonation of the singer. Silences are filled with graceful movements and is one of the best and perfect tools to convey emotions in Dance.

Thirmanam

// taka tadi ki ta dhom taka tadi ki ta dhom taka tadi ki ta dhom
 3 4 5

Ta di kita dhom taka tha di kita dhom tha ka di kutha di kita dhom
 4 4 4

taka tadi ki ta dhom taka tadi ki ta dhom taka tadi ki ta dhom
 3 1 3 5

Ta di kita dhom taka / tha di kita dhom tha ka di kutha di kita dhom
 4 4 4

taka tadi ki ta dhom taka tadi ki ta dhom / taka tadi ki ta dhom
 3 4 5

Ta di kita dhom taka tha di kita dhom tha ka di kutha di kita dhom //

Thillana

It is a short and crisp musical form. It is seen dominantly in the arena of dance. It is rendered at the end of a musical concert, because of its attractive tune and fast tempo. Jathis and sollukattus are the main and special features of Tillana found throughout the piece. The thodi Tillana given below are composed of jathis like dhim, dirana, deerana, tana which has kārvai with the counts of 3,4 sub units.

Tillana: thodi tala: rupaka

<i>pallavi</i>							
<i>dhīm dhīm dhīm</i>	<i>dirana dhīm</i>	<i>dhirana tana</i>	<i>dhiranana</i>				
3	3	3	3	3	3	2	4
<i>anupallavi</i>							
<i>dhīm dhīm dhīm</i>	<i>dirana dhīm</i>	<i>dhirana tā</i>	<i>ni ta ka</i>				
3	3	3	3	3	3	3	3
<i>dhītlām tarikitathom dhītlām tarikitathom dhītlām tarikitathom</i>							
4	4	4	4	4	4	4	4

Research survey on silence through Statistics

Latest researches on silence speaks about mindfulness and silencing. The silence is analysed statistically and expressed in the form of Bar diagram and Pie Diadram.

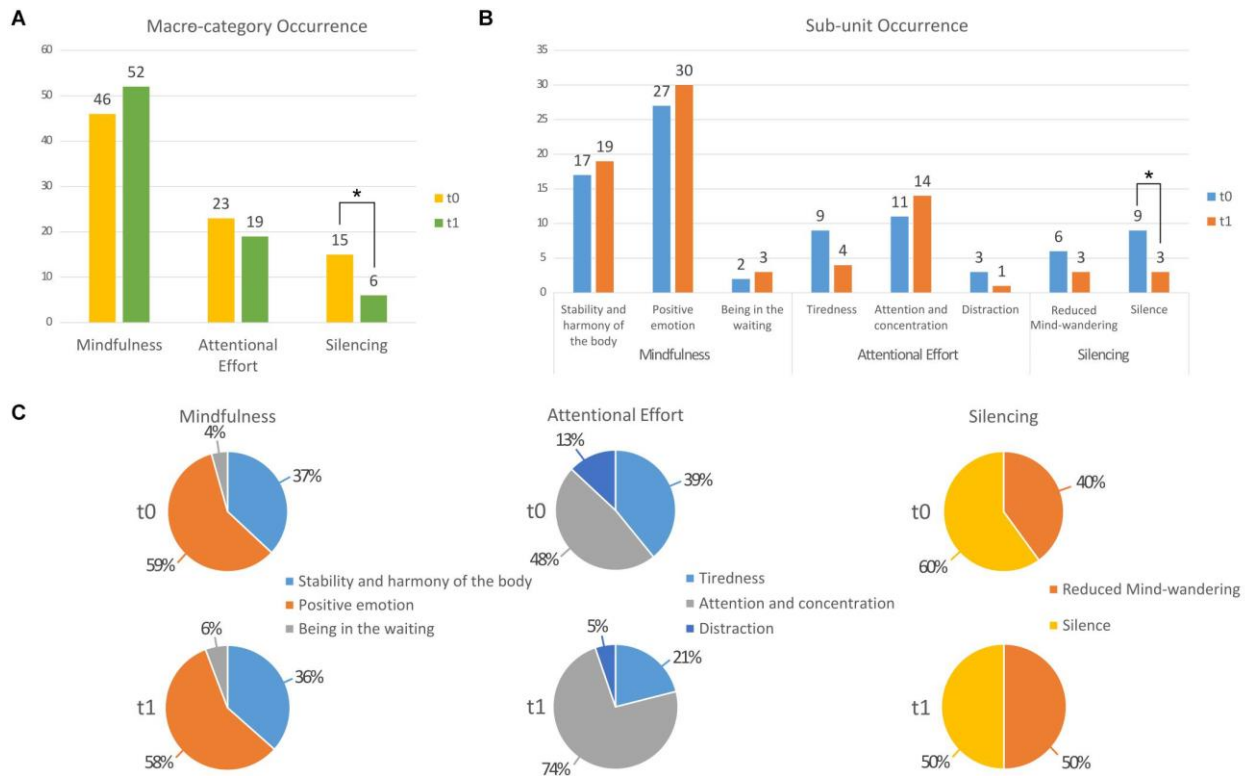
Mindfulness

A state of being alert and wakeful can be called as Mindfulness. Mindfulness is the mental state attained by concentrating on the present moment calmly accepting one's feeling, thoughts and bodily sensation. It is one of a therapeutic technique. It is a type of meditation.

According to the bar diagram and pie diagram of T₀ - in mindfulness the Positive emotion is 59 % and the stability and harmony of the body is 37% when additional efforts added with 48% of attention and concentration (39% tiredness and 13% of distraction) the silencing shows 60% silence and 40% reduced mind wandering.

In T₁ - in mindfulness the Positive emotion is 58 % and the stability and harmony of the body is 37 % when additional efforts added with 74% of attention and concentration (21 % tiredness and 5 % of distraction) the silencing shows 50% silence and 50% reduced mind wandering. With additional efforts the silence is increased with reduced mind wandering.

Statistical analysis on Bar diagram and Pie diagram



CONCLUSION

Silence is versatile in nature with respect to many fields of study.

1. Silence in temple and religious place is inner stillness. In spirituality it is stillness both mind level and body level. Silence considered to be the highest form of sadana or practice to attain moksha in spiritualism.
2. Rhythmic silence in Music is an elongation of crucial element that is employed in the creation of these complex pattern. This kārvaī is an amalgamated form of markings like kama, dots, sollukattu can produce wonderful rhythmic patterns. The aesthetic beauty is shown out beautifully when the pattern is repeated many times in dance and in percussion instrumental shows and cine music.
3. Silence is one of the best and perfect tools to convey emotions in the form of silent expression in dance, dramas and films.
4. Silence in Music is meaningful rest with respect to time sense. Silences are already constructed and rendered as musical composition which are called planned Silences which enhances the music.
5. Silence encourages discipline and concentration in Educational Institutions and libraries.
6. Silence has significant Psychological and mental health advantages which gives greater sense of peace. Hospitals maintain silence on health grounds.
7. Silence is the best device used in horror movies to build a tension before a critical and terrific moment.
8. Researches on Mindfulness with additional efforts on silence the peacefulness is increased with reduced mind wandering.
9. Researches on silence shows pulsating micro structural changes in the uncinated process in Vertibra. Uncinated process is located on the margin of superior endoplates of the cervical vertebral bodies. (C3, C7).

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