

The musical-acoustic experiment and the influence of behaviourism from an evolutionary perspective

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***Abstract:** This paper present music's effects upon human being, animals and plants. The music can influences in a positive or negative way depends on proportion between its components (melody, rhythm, harmony). The music power to change the feelings is real. An induction argument is diametrically opposed feelings by hearing the same piece of music. The difference is derived from the interpretation in distinct manners of articulation and tempo. Among the conclusions of the study to include awareness of the impossibility of holding control over our emotional response to music heard.*

Key-words: corpus callosum, brain's electrical waves, non-neutrality of music, classical music, rhythm.

1. Introduction

This paper deals with one field, which stands as a concern of mine for a long time. It is the necessity of understanding if the music has any influence over the human being on short or especially on long terms.

It is also interesting to discriminate the good music from wrong music.

On consequence in the first part there are some physiological contents about human brain and the Biomusic branch.

The next section try to pull down the myth about neutral music. There are a lot of experiments, of some famous personalities from science fields.

The last two sections treat positives and negatives effects of music. A difference between good music and distructive one has to be done.

The conclusions come from diversses experiments with people at different ages and also on plants and animals.

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2. Biomusic and the way that music influence over human brain

From evolutionary perspective, the brain consist of three parts:

- a) the primitive part of the brain – brain stem, the so-called reptilian brain,
- b) the middle brain or mammalian brain,
- c) the new brain which developed last consisting of two brain's hemispheres connected by a bridge – the corpus callosum.

In *Nature Magazine* from July 2003, Petr Janata and Scott T. Grafton explain:

“Our perception of music is complex, because it is sum of some essential different musical elements: pitch, intensity, duration, rhythm and musical memory for what has just been played. The stimuli are spread across many different parts of the brains” (Janata, 2003, 682-687).

The basic primordial brain of reptilian rhythms and functional automatics and here is the rhythm's receiver.

The middle brain, where emotions are located is responsible with emotions release and musical language translated into the state of mind.

The limbic system is responsible for harmony and consonance.

The neocortex processes music in both of his hemispheres it is just too simplistic to claim that music is localised in the right brain hemispheres alone. This part of brain is specialised in the perception of spatial musical elements, that is the sense of harmony and pitch, whereas the left hemisphere perceives the progress of the melody, wich requires musical memory.

The corpus callosum has also an important place for a complete musical perception, acting like a sensorial bridge between brain's hemispheres.

Dr. Norman M. Weinberg from California University says: “This is appears that music is able to coordinate the two brain's hemispheres and hence the division of work which exists between both cerebral hemispheres – via the corpus callosum - the nervous electric conection bridge. The right hemisphere primarily perceives notes, melodies, patttern recognition, imagination and image formation and left hemisphere which handes the more logical processes” (www.muzica.uci.edu).

For depresives patiens the electric activity transpheres from a hemisphere to another under the music influence is thus there for in melotherapy known as *Mozart effect*, the ability to coordinate the perception of time and space - corresponding to this coordination between the two brain hemispheres.

The accoustic nerve runs to the middle brain and is located very close to the centre which regulates hunger, satiety, metabolism and level of conscious as well as the centre which controls overall hormon regulation.

Psychologiste Mary Gryffiths in “Introduction in Human Psychology” (1974, 474-475) writes: “Hypothalamus controls tyroidian glands secretions, of the

cortically adrenalin and sexual glands. It has an main effect in producing autonomes reactions gave by fear, anger and other emotions”.

The electrical waves in the brain (EEG) registrations – can be influences by music. EEG waves are divided into high and low frequencies.

The high frequencies Beta waves are associated with activation of the brain, a high degree of alertness, agitation, intellectual activity, activity directed towards the outside world.

Stress is often linked to an over activation of these Beta waves.

The Alpha waves are particularly associated with relaxation, imagination and meditation. There are stimulated with the closed eyes and covered ears.

The even slower Theta waves accompany deeper meditation and sleep like states.

The lowest frequency Delta waves correspond to brain waves during deep, dreamless sleep and are also present in unconscious patients.

The classical music causes into the brain changes from Beta to Alpha activity, and the process is made by increasing melantonin secretion, a hormon which contribute to calm state of mind.

On opposite side, the rhythmic music as *rock beat* can produce the lowest frequency waves, Delta waves which can cause in time self unconsciousness (Adolescence 1988, 109-116).

Anne Rosenfeld in *Psychology Today* (1985, 54) write: „The Rock music enhances a lot of turbulents, sexual excitations feeling and the persistent rhythm is an artificial way to stimulate the electric rhythm into the brain.”

In *The Columbus Dispatch Magazine*, (1970, 24-27) relates another interesting study, the motor pulses produced by the brain to different musical stimuls were measured. The range of music included rock, blues, classical and ethnic samples. It was found that especially when rock music and jazz were played the motor pulses produced normality by the brain during sexual arousal.

From these discoveries is necessarily to follow some experiment about how music influence over human, plants and animals.

3. Is the music neutral?

We start with an unauthorized position of neutrality of music, it says that music has not a spiritual or emotional segnificants. It sustaines that subject is who give a positive or negative sense because of his culture, temperament or state of mind at that moment. Music is just a secondary background without moral or spiritual consists.

Now we follow the statements of two of the greatest ancients philosophers, Platon and Aristotel, about the power of music.

Platon in his *Law* said: „Through foolishness the people deceived themselves into thinking that there was no right or wrong in music, and that it was to be judged *good* or *evil* by the pleasure it gave”.

Aristotel in *Politics* write: „In addition to be common pleasure music have also some influence over the character and the soul. People are affected by it are proved in many ways ... rhythm and melody supply imitation of anger and gentleness and of courage, and temperance and of all qualities of character”.

One essential detail is to find that a sound alone is neutral, but mixed with other sounds it make sense.

Perhaps someone is asking him self the question: „But how a musical sound can be inherently good or evil? Isn't note just a matter of pitch variation, tonal vibration, compression and decompressions of air?”

Some years ago, someone was defending the neutrality of music in a public service. He walked over the piano and played a C major chord. Then, he asked the audience if it was a good C major chord or an evil C major chord. After some scattered laughter, he said „See? There's no such thing as good or evil music!” he made a rather obvious mistake, however in his reasoning: a C major chord isn't music! It is a building block of music – and there's a big difference. Speaking about Romanian Language, for example if someone write the „D” letter is a good D or evil D? Neither. It is a neutral entity as a building block of the Romanian Language. But he can make words with D letter for communicate something like „Dăruire” or „Distruhere”. These two words means two opposites attitudes.

Professor Frank Garlock in *The Big Beat* said: „The words only let you know that the music already says. The music is its own message and it can completely change the message of the words” (1971, 31).

Moreover, music may provide a form of non-verbal communication whose meaning is ineffable, it cannot be captured in words. Certainly music exists because of the need for expression, particularly of emotions that can only crudely be measured or described in words.

An experiment made by Patrick Juslem from Uppsala University in Sweden is remarkable in relationship with some different components of music and the relevant well outlined emotions. He asked a guitarist to play the same musical selection at four different times to express each of these four different emotions. Taped of these four performances were played to adults who and this case had a moderate amount of instrumental music training.

The guitarist was able to communicate emotional feelings intended to because the auditory connected right, each auditions to the emotions intention.

This agrees conveys emotions. But not in this case, that the music was always the same piece, just played differently. So in this situation, it wasn't the composer's emotional intention, but that of the instrumentalist. When he analyzed the details

structure of each performance he found that two musical dimensions could explain changing of emotional meanings: tempo and articulation.

Tempo were either fast or slow, while articulations were either staccato or legato.

Here are the results:

- Happiness = fast and staccato
- Sadness = slow and legato
- Anger = fast and legato
- Fear = slow and staccato

Thus we have to confront the possibility that we are not in complete control of our emotional states in response to music. To the extend this is true there seem to be limitation on our „freewills”.

Carol Krumhansle from Cornell University made another experiment about musical effect, especially classical one. He recorded different physiological measures while listeners, college students who had about seven years of instrumental training, heard music that had been independently judged to be one of three moods: *happy*, *sad*, and *fear*.

Not surprisingly they correct matched the music to the emotions. The examples of selection were: *Spring* from *The Four Season* by A. Vivaldi, for *happy*, *Adagio for Strings* by Samuel Barber, for *sad* and *Night on Bald Mountain* by Modest P. Musorgski for *fear*. (Canadian 1997, 51; 336-354)

Some researchers, among them, John Kratus from Cleveland, Ohio, Dr. Robbazza from Padova, Italia and Dr. Carlo Giomo from Mesa – Arizona, working independently, proved naturally the children are able to understand the music’s language and it’s messages.

Different group of five and nine years old children listened classical music that had been divided through expressing different emotions as happy, sad, calm, anger, fear, dynamic. To avoid limitatons of language of the five year old, while using the same response measure, the children matched various cartoon faces to the emotions they thought the music represented.

Both age group did very well at matching emotions to the music. Even, the five years old did as well as the nine year olds. (Robbazza, Macaluso, D’Urso, 1994)

Stephan Koelsch and his co-workers in Leipzig, Germany, studied adults who had no musical education. They were given a series of chords, which infrequently contained a chord that did not fit the key implied by the chord sequence. The subjects didn’t know about chords or key structures. All of them, without exception had corectly noticed which of the chord didn’t fit the key.

Thus, the brain seems to make musical sense out of sounds, at an automatic and unconscious level. Therefore all people are basically musical although the don’t know it. (St. Koelsch, 2000)

Laura Lee Balkwill, as a conclusion to her research said: „The people are not able to understand music through, their education, within their regional culture, but in independence from this.

The music has power to communicate specific emotions not merely cultural but reflects more basic human processes (Lee Balkwill 1999, 43).

Another authorized voice, Dr. Howard Hanson from Eastman School of Music, University of Rochester, in *The American Journal of Psychiatry* says „The music is made of a lot of ingredients and in connection with proportions of these, music can be soft, vibrant, precious, vulgar, philosophic or orgiastic. The music can be good and can be evil” (Hanson 99-317).

4. The music results over fetuses and babies

Dr. Thomas Verny in *The Secret Life of The Unborn Child* cites scientific experiments showing that babies preferred Mozart and Vivaldi to other composers.

He reported that fetal heart rates steadied and kicking lessened, while other music, particularly rock drove most fetuses to distraction and they kicked violently when it was played to their mothers.

The researcher from clinic of California University showed the premature babies take weight and breath efficiently when they listen soft classical music. (Kaminschi and Hall 1996, 45-54).

Dr. Jaine Standley from Florida State University, Professor of Music Therapy made a special device that contained a sensor which was connected to a music delivery system.

For the babies who are premature with suckling difficulties, was the way to solve the problems.

The infants soon learned to suck to obtain lullabies.

Sharon Begley wrote in her article from *Newsweek*, 97-24 (2000, 50), follows, „infants recognize that a melody whose pitch or tempo has changed is the same melody, for instance suggesting that they have a rudimentary knowledge of music’s components. They smile when the air is filled with perfect fourths and fifths intervals and they reacting painfully the ugly tritone and dissonants (Begley 2000, 50).

And Robert Lee Hotz in *Times Magazine* is the same opinion: „By four months of age babies already prefer the more musical intervals of major and minor thirds and sixths to the more dissonant sounds of seconds, sevenths” (Robert Lee Hotz, 2002).

Also in the *Time Magazine* it revealed that „Among expert musicians, certain areas of the cortex are up to 5% larger than in people with little or no musical training in early childhood. The neural bridge that links the brain’s hemispheres

called corpus callosum is up to 15% larger.”

A professional musician’s auditory cortex - the part of the brain associated with hearing contains 130% more grey matter than of non musicians.

Tim Radford in *The Guardian* added the news that for the musician the process of getting older brain is slower than the no musicians. (Radford, 2003)

The musicologist Julius Portnoy in *Music in the Life of Man* said “Music not only change metabolism, affect muscular energy, raise or lower blood pressure, influence digestion internal secretions and respiration it may be able to do all the things more successfully than any other stimulants a that produce those chances in our bodies.” (Portnoy, 1963).

The professor Tore Sognefest had surprised the effect of rhythm upon pulse to teens in a Bergen – Norway, High School – when the students listened rock music the pulse encrease with 10 beats per minute then the average rank.

But when they listened „Arie from suite” by Bach, the pulse slowed down with about five beats per minute under the normal rank.

In the same fiels, C. F. Chametsky and F. X. Brennan Jr., showed that from four different music’s styles modern, classical, music from radio and absolutely silance salivary imunoglobuline encrease obviosly just in case of classical music. (*Perceptual Motor Skills*, 97:1163-1170-1998)

At Baltimore’s St. Agnes Hospital, classical music was provided in the critical-care units „half an hour of music produced the same effect as ten miligrams of Valium” says Dr. Raymond Bahr, head of the coronary-care unit.

5. The music results over plants and animals

The music is a physical reality.

The accoustic as a Physics’s branch deals with sounds.

The music has directly a physical effect our nature, including determinated physically states of mind because we, human being, are also physical structures with an affectivity and spiritually depending to our physical reality.

In order to evoid subjective element, from their researches, the scientists apealed to living uncounscious world.

There are a lot of experiments did on plants and animals.

In one of these experiment, conducted over three weeks by Dorothy Retallack, in wich she played the music of Led Zeppelin and Vanilla Fudge to one group of beans, squash (marrow, corn, morryng glory and coleus). She also played contemporary avantgarde atonal music to a second group and, as a control group, played nothing to a third group.

Whitin ten days, the plants from first group were all leaning away from the speaker. After three weeks they were stunted and dying.

The beans exposed to the *new music* leaned 15 degrees from de speaker and were found to have middle-sized roots.

The plants left in silence had the largest roots and grew the highest. Further, it was discovered that plants to which placid, devotional music was played, not only grew two inches toller than plants left in silence, but also leaned towards the speaker. (*The Secret Power of Music*, 142-144)

Dr. T.C. Singh, head of the Botany Departament at Annamalia University from India, demonstrated through his experiments that not only did certain forms of music and certain instrument (specifically classical music and the violin cause plants to grow at twice their normal speed) but that later generation of the seeds of musically stimulated plants carried on the improved traits of greater size, more leaves.

Dogs are more relaxed well behaved when listening to classical music, for example. The dogs made noise when listening Heavy Metal – ironically or not, Bach had then barking least of all.

In *The Virginia Pilot* journal published the experiments of David Merrall a 16 years old student from Nansemond River High School assisted by some teacher.

Using 72 male laboratory mice, a stop watch, a 5 by 3 foot maze and he music of Mozart and Antrax, David worked with an Old Dominion University statistician to establish that hard rock impedes learning.

During the process the rising junior captured 6 trophes in regional and state science fairs and earn accolades from the Navy and CIA.

David assambled three separate groups of 24 mice: a control group, a hard rock group and a classical group. To ensure scientific validity each white mouse weighed between 15 and 20 grams, was 4 to 6 weeks old was bred to ensure no genetic abnormalities existed.

Each mouse navigated the maze to establish the base time of about 10 minutes.

Then David started piping in music 10 hours a day. The control group navigated without music. He put each mouse through the maze three times a week for three weeks.

The results:

- 1) the control group shaved 5 minuts from its original time.
- 2) the mice that navigated the maze with Mozart knocked 8½ minutes off their time, in just 90 seconds.
- 3) But the group listening to hard rock bumped through the maze, dazed and confused, taking an average of 30 minutes, tripling the amount of time it previously took to complete the maze. Most noticeably the hard rock mice didn't sniff the air to find the trails of other that came before them.

It was like the hard rock music dulled their senses.

During the three weeks experiment, David housed each mouse in separate aquariums. That's because a year before, for a similar project he kept each group together.

„I had to cut my project short because all the hard rock mice killed each other, until the last one”, David said.

6. Conclusions

At the end of this article it can draw some conclusions.

One of them which I'm totally agree is inside of Dr. Max Schoen statement „Music is the most powerful stimulus known among the perceptive senses. The medical, psychiatric and other evidence for the non-neutrality of music are so overwhelming that is frankly amaze me that anyone should seriously say otherwise”.

Not pretending to cover this wide subject, it can be take it serious such a concern. The music is all over the places aut or in our minds and bodies, and that is the reason that we must be very carrefully in what music we deal with. Because it can have good or bad influence over us.

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